# ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXVIII. No. 3558. FEBRUARY 1, 1946 9d. WEEKLY


# Appliance Production

## The Endeavour to Satisfy Competing Demands

LAST week another statement on the position as regards the availability of building materials and equipment was issued by the Ministry of Works. The last statement of this kind got us into trouble with some of the manufacturers of the equipment concerned who failed to appreciate that we were merely reproducing a supposedly authoritative survey of the subject. The present statement is similar to the last and it shows where the capacity, labour and materials available for producing certain classes of goods is sufficient to meet all needs, including orders for stock. Production of two electrical items only is said to fall short of the demand—cookers and conduits.

It is not made sufficiently clear (in fact it is left to be inferred) that the statement relates to the position as it affects the Government's housing programme, which takes precedence over all other requirements. The rate of construction of new houses is so gradual that to say that manufacturers of equipment are able to keep up with it is not saying much.

### Export Position

What is happening in connection with the second "priority"—export? Manufacturers of electrical appliances have been given *carte blanche* in production for overseas markets, subject only to the proviso that the new houses are first catered for. A fair amount of trade is being done in this direction although here another handicap has been encountered, shortage of shipping. As regards cookers, however, there is a very small balance for export after meeting new housing needs. It has been estimated that under present labour conditions this balance will be under 10 per cent. during this year.

It will be judged that by the time these two preferential classes have been satisfied there is likely to be little left for the Home market in existing circumstances. As this market has received but a small fraction of its requirements during the past six years, replacements alone probably represent a larger volume of business than new houses and exports together.

### Prolonged Abstinence

While the Government insists that at the moment the Home market must be content with any scraps that may be available after the principal needs have been met, the people are naturally becoming a little restive at the prolongation of their enforced abstinence from a great many essential things, as well as aids which may legitimately be called semi-luxury goods in wartime but are part of a reasonable standard of life in modern civilised society.

It may be thought that the electrical industry has no better claim than others for a larger share of the still limited labour available, but many goods of a less essential character are appearing on the market in considerable quantities nowadays. Apart from securing more labour there is also the problem of retaining young key men until they can be replaced. We hope that the representations which B.E.A.M.A. is making to the Government regarding labour difficulties will produce positive results.

**Intermittent Heating**

ELECTRIC fires installed for warming rooms for occasional occupation need to have a margin in hand in order that the time taken to reach a comfortable temperature in cold weather shall not be unduly prolonged. Moreover, heat losses are less with shorter pre-heating times. The Report on Heating and Ventilation discussed here last week submits that the standard advocated would be reached in 1½ to 2 hr. in an ordinary room warmed daily from cold from radiant sources if the hourly input of heat is two to three times that needed to maintain a steady temperature. This is a point to be considered when deciding the kW rating of fires, and hence of plugs and cable connections, if a charge of "slowness" is not to be brought against electric heating.

**Intrinsic Safety**

LIABILITY of a spark to cause explosion depends upon a large number of variable factors and the Safety in Mines Research Board has recently drawn attention to their complex and still uncertain relationship. The nature of the problems involved is indicated in an appendix to the new B.S. 1259, 1945 (British Standards Institution, 2s. post free). At the present stage of knowledge the Specification itself cannot be expected to do more than define what is meant by "intrinsically safe," which term should be restricted to a circuit or piece of apparatus in connection with which sparking will not in normal working cause an explosion of a given inflammable gas. Safety is thus conditional, not absolute. The precise electrical characteristics that comply with this definition await further investigations.

**Circuit Breakers in Australia**

AIR-BREAK switchgear of the deionising and magnetic blow-out types should find considerable scope in Australia, Mr. A. S. Faulkner stated at an I.E.E. meeting in Brisbane. Their special field will, he believes, be for high-voltage work in unattended substations where frequent operation must be accompanied by a minimum of maintenance and where the use of compressed air is undesirable. He foresees increasing use for air-blast breakers also, provided they can be produced economically for installation in the Dominion. He is in agreement with many in Britain who hold that, for voltages up to and including 11 kV, modern oil-immersed switchgear will be difficult to replace by any other type.

**Load Shedding**

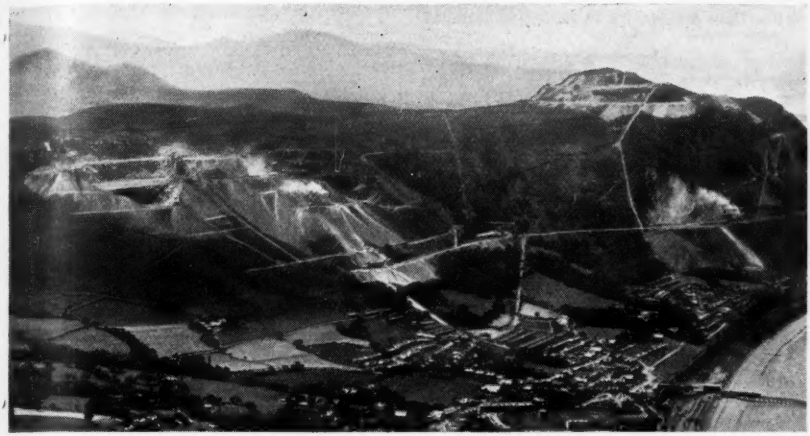
AN addition of only 227,000 kW of new generating plant to meet a rise of 285,000 kW above last year's demand (and the position was precarious then) provides sufficient explanation of the recent cuts in electricity supply. Even that meagre addition is whittled down by nearly one-fifth owing to the causes analysed in this issue. The wartime origin of the initial deficiency in plant capacity has been discussed in these columns; so have the subsequent delays in manufacture, resulting from there being too few men in the factories as there are for maintenance in the power stations.

**System Control**

FOR the minor character of the brief interruptions in the supply of electricity —less than 2 per cent. of the total peak with a slight drop in frequency—credit must be given to the operating staffs of the Central Electricity Board and the undertakings. Even with a safe margin of reserve plant, to "scale the precipice" of the morning peak (in one half hour the rate of rise exceeded 1,000 kW per sec.) would call for a rare ability to make quick decisions correctly on the part of the control engineers. In present circumstances the tax must be far greater. A flair for improvisation could hardly suffice unless it were backed by previously worked-out plans for meeting all possible contingencies and combinations of them.

**Electrical Textile Mills**

"DE-CONCENTRATION" of the wool textile industry is now being proceeded with and lists of firms which desire to restart are being considered by the Central Concentration Association of the industry. In selecting firms for re-opening the Association is bound by conditions laid down by the Board of Trade, one of which is that preference shall be given to electrically-operated mills. We are in agreement with this stipulation, but largely for a different reason. The Board has fuel economy in mind but surely efficiency of operation is even more important.



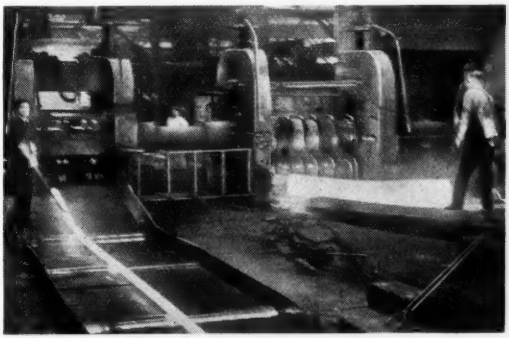
# Industrial Load Building

## Electrical Survey in North Wales

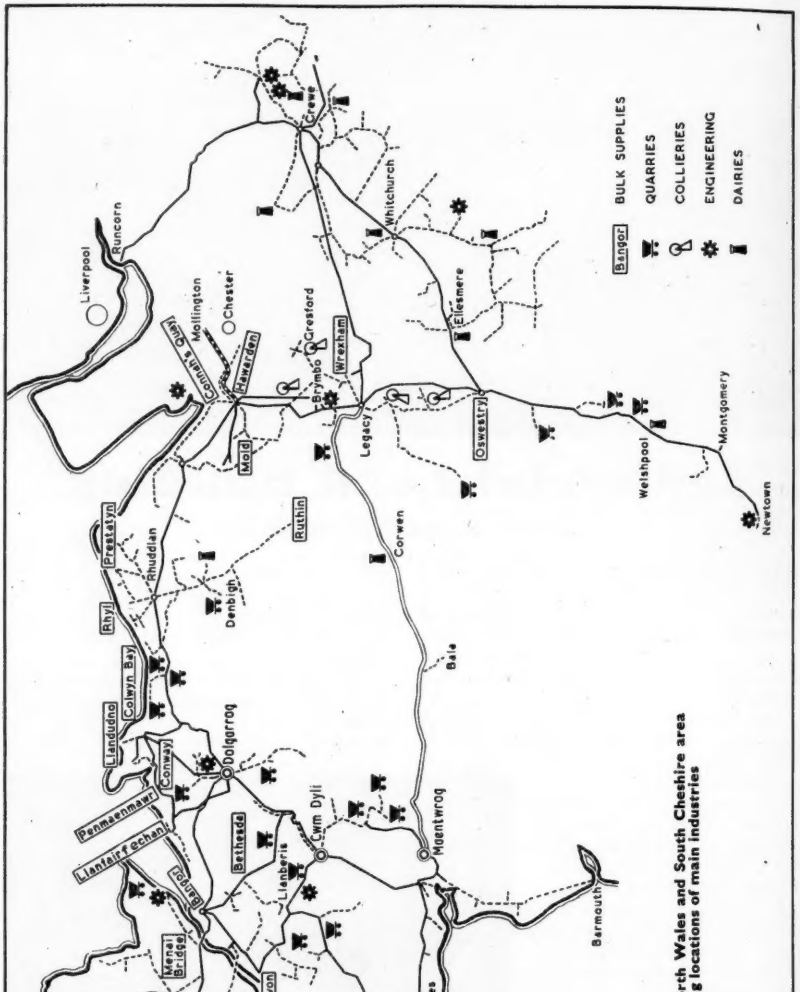
WE dealt with generation and distribution activities in the North Wales and South Cheshire area in the *Electrical Review* of December 14th, 1945, and January 4th, 1946; we now propose to describe the industrial load-building work which has been carried out in the area.

The North Wales and South Cheshire Joint Electricity Authority was formed in 1923. The area covers 4,087 sq. miles and the greater part of it is administered to-day by the North Wales Power Co., Ltd., and its associated company, Electricity Distribution of North Wales and District, Ltd. Of the twenty-four authorised undertakers whose areas of supply lie within the J.E.A. district, nineteen take indirect bulk supplies from the Central Electricity Board, with the North Wales Power Company acting as an intermediary, one undertaker receives its supply direct from the Board, and four operate independently. The J.E.A. assigned to the power company certain powers under which the company has taken out and operates five Departmental Orders covering Newtown (Montgomery), Bala (Merioneth) and Dolwyddelen (Caernarvon), and two Distribution Orders in respect of areas in the Isle of Anglesey. In addition it operates the Llanrwst, Trefriw and Bettws-y-Coed Orders.

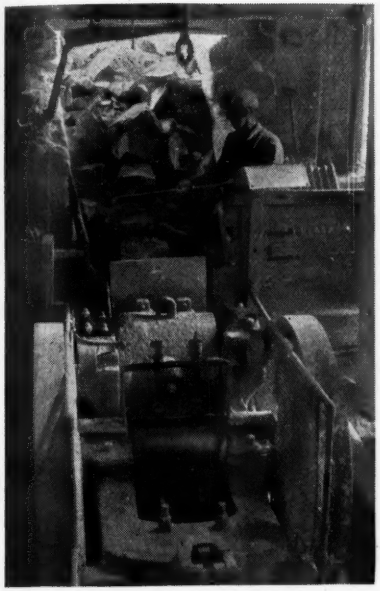
The average density of population is 152 per sq. mile, but excluding the more congested urban areas it is 116 per sq. mile. The number of direct consumers of the companies at the end of the year 1944 was 55,795; they purchased nearly 27 million kWh for lighting, heating and cooking, and 227 million kWh for industrial purposes. The



**Rolling mills at Brymbo Steelworks**




**Map of the North Wales and South Cheshire area showing locations of main industries**

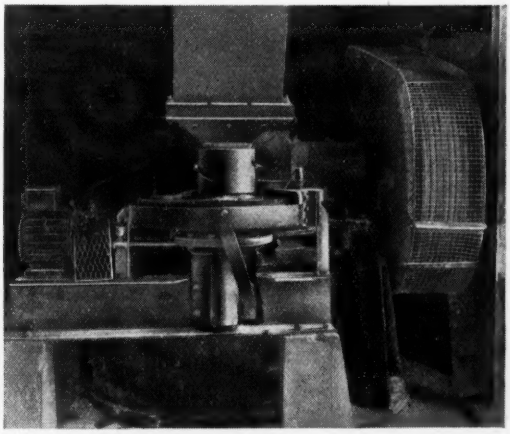


**Primary crusher at Minffordd quarry**

authorised undertakers who receive an indirect supply through the company's transmission system are Bangor Corporation, Bethesda U.D.C., Caernarvon Corporation, Colwyn Bay Corporation, Conway Corporation, Connah's Quay U.D.C., Hawarden R.D.C., Holyhead Corporation, Llanfairfechan U.D.C., Llandudno U.D.C., Mold U.D.C., Menai Bridge U.D.C., Oswestry Corporation, Penmaenmawr U.D.C., Prestatyn U.D.C., Rhyl Corporation, Ruthin Corporation, Wrexham Corporation and Yale Power Co., and in 1944 they purchased 98·8 million kWh out of a total of 378·8 million kWh sold by the power company. The engineering and metal group of industries purchased 101·7 million kWh in 1944. Included in this important group are John Summers & Sons, Ltd., Hawarden Bridge Steel Works, Shotton, and the Brymbo Steel Co., Ltd., the company's largest single consumer. With a demand in excess of 10,000 kW and a consumption of about 50 million kWh, Brymbo works are engaged principally in melting, refining and rolling steel (see *Electrical Review*, December 7th, 1945).

Although supplied by a direct 66-kV duplicate circuit from the C.E.B. substation at Mollington, the Hawarden Bridge Steel Works of John Summers & Sons, Ltd., are, nevertheless, a consumer of the power company. The dimensions of these works can be measured in terms of their present electricity consumption of approximately 1,650,000 kWh per week, part of which is privately generated. The supply from the power company serves principally the hot strip mill, with all the main driving motors located in a motor room which is force-ventilated by means of five fans. Each of the three roughing stands is driven by a 2,500-HP AC motor, and five DC motors drive the finishing stands for which variable speeds are essential. Nos. 4, 5, 6 and 7 stands are each driven by a 3,000-HP motor, and No. 8 stand by a 2,000-HP motor.

The Aluminium Corporation, Ltd., whose works are alongside the Dolgarrog power station, were engaged during the war years on the reduction, refining and rolling of aluminium, and during the peak year of 1943 they consumed 53·8 million kWh. Amongst the engineering works located in the South Cheshire area, Fodens, Ltd., the commercial vehicle makers, consumed 3·38 million kWh



**10-ton limestone grinder at the Halkyn Mines driven by a 100-HP motor**

in 1944. The Newtown Tube Factory of Accles & Pollock, Ltd., has an annual consumption of 1,450,000 kWh, and converted slate dressing sheds in the Llanberis area, occupied by Hunting Aviation, Ltd., and engaged in aircraft component manufacture, consume a further 1,067,000 kWh. Saunders-Roe, Ltd., Beaumaris, who have been fitting out flying boats, are responsible for 627,000 kWh per annum.

Whilst many of the foregoing are wartime increases, there is a very strenuous movement in the area to retain some of this engineering activity to supplement the native

**Penrhyn slate quarries, Caernarvonshire**

**Above: Bersham Colliery, one of the eight collieries served at the works of William Hancock & Co. (Hawarden), Ltd. Right: Clay rolls and brick-making machine**

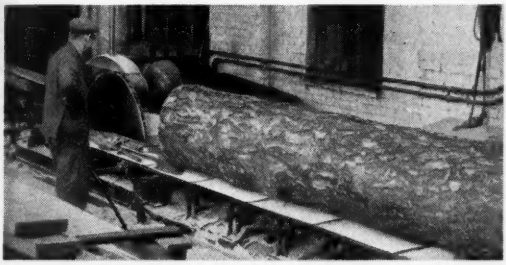
extraction industries. There are, however, many smaller engineering firms with long association with the area. For instance, Pring's Wire Works at Elworth are in peacetime primarily occupied in steel-wire drawing and furniture-spring making; Salopian Engineers, Ltd., at Prees, manufacture cattle pens, cattle drinking bowls and farm implements, and W. H. Smith (Whitchurch), Ltd., produce galvanised-steel buildings and similar structures.

The next group of industries, in importance, comprises those which cater for the railways and port facilities and are collectively responsible for a consump-

**Explosives factory at Penrhyndeudraeth**

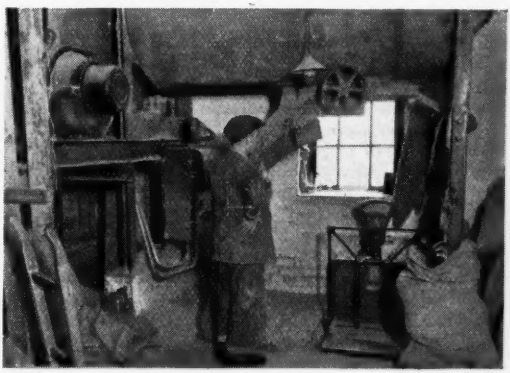
tion of 20·1 million kWh per annum. The L.M.S. Railway works at Crewe have an annual consumption of 18·9 million kWh and the port facilities at Holyhead, Port Penrhyn and Port Dinorwic account for the rest.

In the slate quarrying industry are found the three oldest consumers of the power company, one dating back to 1906. Slate quarrying is carried on principally in the valleys of mid-Caernarvonshire, together with the area adjacent to Blaenau Festiniog, Merionethshire. The industry has suffered in the last eighteen years from the use of manufactured tiles; whereas in 1926, out of a total of approximately 300,000 tons of slate used for building and other purposes, Caernarvonshire and Merionethshire jointly produced more than 250,000 tons, we doubt if to-day's figures represent half these values. The annual consumption of the slate industry is at present about 4·7 million kWh. In Caernarvonshire the slate is generally obtained from open workings, and the company's two principal consumers in this area are the Dinorwic Quarries, Llanberis, and the Penrhyn Quarries, near Bethesda. In the Merionethshire slate quarries, the Oakeley Slate Quarries Co., Ltd., is the largest consumer and, in addition, supply is taken at the Llechwedd Quarry of J. W. Greaves & Sons, Ltd., the Maenofferen Quarry Co., Ltd., and the Manod Quarry Co., Ltd. The last three workings are underground and the mines frequently extend more than 1,000 ft. below surface level, and have up to twenty floors. It was in one of these mines that the art treasures of the National Gallery were lodged for safe keeping during the war.



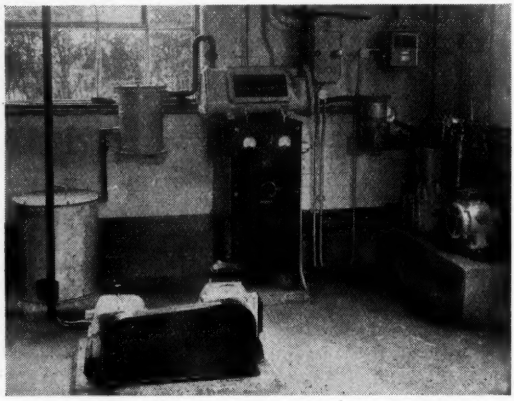
**60-in. log saw at Victoria Saw Mill, Willaston, Cheshire**

Another good load-building field is that which embraces the limestone and granite quarries which are responsible for an annual



**Mixing and bagging machine at Calveley Mill (Cheshire Farmers' Association)**

consumption of about 7 million kWh. The foremost of these quarries is the extensive workings of the Penmaenmawr and Welsh Granite Co., Ltd., on the North Wales coast (illustrated in the heading block to this article), with an annual consumption of about 2·9 million kWh. The British Quarrying Company's group of three quarries jointly consume 850,000 kWh per annum, and the Minffordd Quarry of the Pwllheli Granite Co. exceeds 290,000 kWh. Amongst the limestone group, the quarry of Limestone Products, Ltd., near Abergele, consumes 580,000 kWh per annum, the average consumption at the Llanddulas works of the Lime Division of I.C.I. is about 460,000 kWh per annum, and the consumption of the Steetley Co., Ltd., at its Llynclys works, approaches ¾ million kWh per annum.

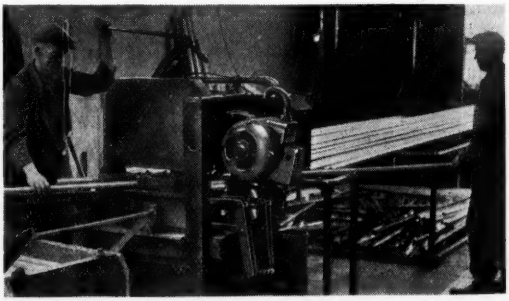


**Ozone making plant for water treatment at Calveley depot (United Dairies (Wholesale), Ltd.)**

The metalliferous mines of North Wales have been worked by one group and another since the time of the Romans, and geological surveys suggest there are still very many years ahead during which the metal veins will continue to be worked. The largest consumer is the Halkyn and District United Mines, Ltd., whose consumption exceeds 1,800,000 kWh per annum; it was more than 7 million kWh before the war. Lead and zinc mining are also carried out in the Esclusham mountain area, and there is every prospect of these industries being further developed. The manganese mines in the Lleyn Peninsula are also active and take supplies for pumping, haulage and air compression.

The North Wales coal industry gives full-time employment to about 8,500 people, and the power company has supply arrangements with eight separate collieries. There are numerous valuable seams running through the area, the principal of which is known as "Main" coal. Its thickness varies from 4 ft. 6 in. to 13 ft. 6 in. in the north, where it is worked by the Llay Main Colliery Co. The power company sells slightly less than 2 million kWh per year to the collieries, and the principal consumer of this group is the Bersham Colliery whose annual consumption is about 1,040,000 kWh. The clay industry is also an important electricity consumer, and in the Ruabon and Buckley areas fourteen brick, tile and ceramic works purchase about 1,500,000 kWh per annum. Amongst the larger consumers are the Ruabon Brick and Terra Cotta Co., Ltd., and William Hancock & Co. (Hawarden), Ltd., where the peacetime consumption was 181,000 kWh per annum.

The factory of Cookes Explosives, Ltd., at Penrhyndeudraeth, has served the excavation industries for many years, and its annual consumption to-day approaches 500,000 kWh. Whilst the Nantwich Tannery of Harvey & Sons, Ltd., continues to handle a con-



**Tube-cutting machine at the works of Salopian Engineers, Ltd.**

siderable quantity of the heavy leathers, practically all types of light leathers were made in North Wales, especially goods for the fancy trades, before the war. Welsh roller leather has been highly esteemed for years by cotton spinners for covering the top rollers in roller drawing. Edward Mills, Ltd., of Llanrwst, and J. Meredith Jones & Son, of Wrexham, are amongst the firms who are taking supplies through the electricity undertaking's network.

Before the war the Welsh Wool textile industry passed through a difficult period, but to-day the principal concern in North Wales, Holywell Textile Mills, Ltd., consumes 225,000 kWh per annum and is expected to increase its consumption considerably when the present restrictions on the supplies of raw materials are removed. The clothing industry, firmly established in Nantwich and Newtown, adds a further 200,000 kWh to the consumption. G. H. Heath & Co., Ltd. of Sandbach, silk throwsters, frequently exceeded 2 million kWh per annum in pre-war days. Some 300,000 kWh per annum is consumed jointly by the eight timber mills on the network, and it is anticipated that this consumption will increase with the installation of additional joinery machinery.

The flour mills at Calveley, Rode Heath and Grindley Brook, are extremely busy at the present time. About 250,000 kWh per annum is consumed at the six mills on the system. The largest group is the Cheshire Farmers' Association, with a combined consumption of 126,000 kWh per annum. Something like 2½ million kWh is sold annually to the milk and food preparation industries. Various branches of United Dairies (Wholesale), Ltd., in South Cheshire alone consume about 1·4 million kWh per year, and the vast dairies of the Milk Marketing Board and the Co-operative Wholesale Society take supplies in Cheshire, and in Anglesey. There are creameries at Llandyrnog and Corwen in the fertile Vale of Clwyd. Benger's infant-food factory at Holmes Chapel and the Trufood factory at Wrenbury are other valued consumers.

Various sanatoria scattered throughout the area represent an annual consumption of 2·7 million kWh. Outstanding amongst this class of load is the Abergele Sanatorium of Manchester Corporation, with a consumption of 671,000 kWh per annum.

## Building Supplies and Licensing

### Continuation of Control

THE existing arrangement for the licensing of building work came to an end on January 31st, but the need for rigid control still persists and accordingly the Minister of Works has made a new Order (S.R. & O. 1946 No. 86) continuing the system. The Order provides that for a further period of six months, *i.e.*, until July 31st, a licence will be required for any work costing more than £10 but an additional expenditure of £2 a month (non-cumulative) will be permitted during that period. Licensing of work up to a limit of £100 or of work to a house or flat, whatever the cost, will remain in the hands of the local authorities; above that amount applications for licences must be made to the regional licensing officers of the Ministry of Works.

In reckoning the amount of work which may be undertaken without a licence no account will be taken of work licensed or authorised by a Government Department or licensed by a local authority; work undertaken by a local authority (*e.g.*, bomb damage repair); or work carried out before February 1st.

Stressing the need for the continuance of the licensing system at a press conference last week, Mr. George Tomlinson, the Minister of Works, said that not only was the supply of labour inadequate for the Government's housing plans and repairs and maintenance deferred during the war, there was also a continuing shortage of building supplies. Steps were being taken to secure more labour for both the building industry itself and the ancillary industries. As regarded the latter arrangements had been made for the release from the Forces under "Class B" of 21,000 men; of these 4,363 had been released up to December 31st last when actually 10,000 were expected to be out.

#### Statement on Equipment

In conjunction with the other Government Departments concerned, the Ministry of Works has issued another survey of the supply position in January as regards building materials and components. Among the equipment for which there is said to be "adequate manufacturing capacity, labour and materials immediately available to meet all probable requirements, including orders for stock" is the following:—Electric ceiling blocks, conduit switches and boxes, electric fires, immersion heaters, lampholders, electric plugs, electric meters, switches and switch-fuses, thermostats, electric washboilers and electric water heaters. It is stated that the supply of conduits and electric cookers is not sufficient to meet all present demands in full.

# Views on the News

## Reflections on Current Topics

THERE was a good deal of disappointment at the 1939 I.M.E.A. Convention over the absence of the usual exhibition which had been an attractive feature of many previous Conventions. It is proposed to restore the exhibition at the Blackpool Convention in June and the British Electrical Development Association has asked manufacturers who wish to take part to give immediate notification. Although the labour situation is unlikely to be anywhere near normal by June and manufacturers may feel hesitant about raising hopes of early delivery of all the appliances which supply authorities need for their consumers, I anticipate that there will be a good response and look forward to seeing some new models.

* * *

I have had a chat with Mr. H. G. Wilson (Partridge, Wilson & Co. Ltd.), about the standard battery vehicle designed by members of the Electric Vehicle Association. While the end of the war has put a stop to ideas of standardisation of complete vehicles, Mr. Wilson says that good progress is being made in standardising various components, for instance terminal lugs, charging plugs and motor specifications. The process is a slow one, however, but it seems likely that before long general agreement will be reached with regard to ensuring a reasonably high degree of interchangeability of components, including batteries. All this will tend to simplify still further the electric road vehicle in the eyes of the user and service engineer alike.

* * *

On the motion for the adjournment of the House of Commons on January 23rd, Wing-Commander Cooper, Labour member for Middlesbrough, raised the subject of building material supplies and in the course of his remarks made the statement that "electric cookers are being produced through the British Engineering Allied Manufacturers' Association. The price paid by the Department after allowing for a reasonable profit comes out at £11 10s., and yet in point of fact they are asking the Ministry the sum of £15, which was the price quoted for bulk purchase two months ago." To discover the facts behind this rather obscure statement I had a talk with Mr. E. G. Batt, chairman of the B.E.A.M.A. Domestic Electrical Appliances Section, who explained that in July last the Ministry of Works Director of Contracts submitted what was described as "a technical estimate of cost prepared by its expert" who gave £11 5s. 8d. as being the cost ex works, excluding packing and delivery and without profit. As the cooker manufacturers, working on the same basis, arrived at a figure of £15 2s. 6d., Mr. Batt suggested that an investigation should be carried out by the Ministry in conjunction with the works accountants in the makers' factories.

* * *

The result of this examination was a figure of £16 6s., taking overheads on direct labour at 300 per cent. at one factory and 330 per cent. at another and giving a profit of 10 per cent. Having regard, however, to previous proposals, the manufacturers offered to accept £15 14s., the M.O.W. on its side offering £14 7s. 10d. After further discussion, Sir Percival Robinson, Permanent Secretary to the Ministry wrote to Mr. Batt on November 15th and, while claiming that the overheads were too high and should not be taken as a precedent, formally agreed to the payment of £15 5s. 4d., which gives an overhead of 250 per cent. on direct labour and a profit of 10 per cent. This figure, which is subject to review in April, has now been accepted by the manufacturers and seems to compare more than favourably from the Ministry's point of view with the price of £13 which it has, I understand, accepted for the much simpler and more cheaply constructed gas cooker.

* * *

Many contractors, and their supervisors and operatives, find the full version of the I.E.E. Wiring Regulations rather heavy going and so the simplified form produced as "The A.S.E.E. Guide to the I.E.E. Wiring Regulations" has had a ready sale. As with other "best sellers" supplies have run out and Mr. A. Brammer, the general secretary of the Association of Supervising Electrical Engineers, tells me that he is unable to accept any more orders for the Guide. He says that if and when a twelfth edition of the Regulations appears the publication of a new Guide will be considered.

* * *

The prospect of the resumption of television in a few months' time raises the problem of the illumination of the "viewing-room." A solution proposed in the United States is provision of fluorescent walls, draperies, slip-covers and carpets, which, when subjected to ultra-violet rays from a "black" lamp, fluoresce and result in a pleasant soft illumination at an intensity which will not interfere with the enjoyment of the television but will eliminate the unsatisfactory blackness of a darkened room.—**REFLECTOR.**

# Tariffs Without Tears

**By Arnold Earls,** B.Sc., M.I.E.E., A.M.I.Mech.E.
(Borough Electrical Engineer, Rothesay)

THE publication by the Central Electricity Board of its new tariffs, the fact that we seem to be permanently committed to an era of much dearer coal, and the change-over from war to peace conditions may be causing many undertakings to consider the adjustment of their charges to meet the new conditions. It would certainly seem that a halfpenny rate is no longer economically sound for any undertaking taking a supply at grid tariffs, and while selected station owners may still be able to get away with ½d. a unit, even they may have to reconsider the question of charging ½d. or even ¼d. as some undertakings managed to do before the war.

In this article I am not concerned either with the relative merits of the various types of tariff in general use, or the general price level at which prices will require to be fixed. I only wish to suggest to those undertakings contemplating changes that the opportunity might be taken, after they have decided from other considerations what approximately the various unit rates on their particular tariff will require to be, to consider the matter from the point of view of the ledger clerk or the prepayment meter collector, before fixing their unit prices exactly.

### Vulgar Fractions

For domestic two-part tariffs the various prices in common use are 1d. per unit, or such fractions of a penny, as ¾, ⅔, ⅝, ½ or ⅓. Not one of those prices gives a simple conversion from units into pounds, shillings and pence. To the early pioneers a penny per unit probably seemed a suitable objective to aim at and because it could be so simply expressed they overlooked its disadvantages which are inherent in our peculiar coinage system. The penny goal having been reached, the next most obvious goal was ½d., and while some reached this others who could not compromised on ¾d., which is now probably the commonest figure of all.

I do not think the reform of our coinage system, and the introduction of decimal coinage, however desirable, is a matter in which the electricity supply industry should take the lead. We have enough to do without that. What I suggest is that when fixing prices we should as far as possible choose figures which, within the framework of our existing coinage system, make the calculations of consumers' bills quick and foolproof.

Now let us consider what exactly a clerk does in making out an item on an account for say 777 units at ¾d. per unit. He (or she) turns up the ¾d. page of a ready reckoner. This, though it will on most reckoners give the money value of about three hundred different numbers on one page, may not give any number near the one required. In this particular case, which I have taken at random, he will find that the nearest number is 750, and that 750 units cost £2 6s. 10½d. He then looks up 27 units which he finds costs 1s. 8¼d. He then has to add the two prices which if he does it in his head he will not generally do either very quickly or with freedom from error. When he gets the answer, £2 8s. 6¾d., he has to write it as £2 8s. 7d.

If instead of ¾d. per unit the price was 0·8d. we would get exactly 300 units per £1, and not some odd number like 240 or 320. This enables the accompanying simple tables to be compiled. These contain only 33 items, against about 300 on the average page of a

**0·8d. per unit.**

| UNITS | SHILLINGS |
|---|---|
| 15 | 1 |
| 30 | 2 |
| 45 | 3 |
| 60 | 4 |
| 75 | 5 |
| 90 | 6 |
| 105 | 7 |
| 120 | 8 |
| 135 | 9 |
| 150 | 10 |
| 165 | 11 |
| 180 | 12 |
| 195 | 13 |
| 210 | 14 |
| 225 | 15 |
| 240 | 16 |
| 255 | 17 |
| 270 | 18 |
| 285 | 19 |

**Hundreds÷3=£.**

| UNITS | PENCE |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | |
| 4 | 3 |
| 5 | 4 |
| 6 | 5 |
| 7 | 6 |
| 8 | |
| 9 | 7 |
| 10 | 8 |
| 11 | 9 |
| 12 | 10 |
| 13 | |
| 14 | 11 |

ready reckoner. It gives the result almost instantaneously for any number of units, however large. The number of pounds is the number of hundreds divided by 3, and the shillings and pence value of the remainder is found from a glance at the table. The table is so simple that any clerk who used it for a day or two would find he had memorised it without apparent effort; actually it practically amounts to remembering the 15 times table up to 300. Take for example the number I have already used—777. The operation would be:—7 divided by 3 = £2 and 177 over; 177 = 11s. and 12 over, 12 = 10d.; answer £2 11s. 10d.

It takes much longer of course to describe the steps of the mental process than to carry it out. The method can of course be applied to any price which gives a whole number of hundreds per £, as for instance 0·3 (800), 0·4 (600), 0·48 (500), 0·6 (400), 0·8 (300), 1·2 (200).

Actually for some of the prices the calculation becomes so simple that no table is required at all. Take for example 0·6d. per unit. In this case not only do we get £1 = 400 units, but also 1s. = 20 units. Therefore the whole operation for our old friend 777 is 7 divided by 4 = £1 and 3 over; 37 divided by 2 = 18s. and 6d. over; 7 × 0·6 = 4d. plus 6d. = 10d.; answer £1 18s. 10d.

I have written these examples out in this manner to make the method clear, but in actual practice of course nothing would be written except the answer in the money column of the ledger. Compare this with 2,345 units at $\frac{5}{8}$d. per unit by ready reckoner.

### Tests of Method

In order to form some estimate of what the actual effects of the adoption of this principle would be, I made a list of 100 readings taken by opening a meter book at random. I asked a competent girl clerk, with considerable experience of calculating units at $\frac{3}{4}$d., to work out the money values. She took 22 minutes and on checking her work it was found to contain one error. I then showed her the above table, explained its workings by a few examples, and set her to calculate the same figures at 0·8. She rather baulked at it at first but after a rather slow start she finished in 13½ minutes, with no errors. She then calculated the same figures again for 0·6 without the use of any table, in 11 minutes, with three errors all due to using 4 as the divisor where she should have used 2.

Another member of the staff took 18 minutes to do $\frac{3}{4}$d. (two errors), but he confessed that he was so familiar with the key figures on the $\frac{3}{4}$d. table that he had been able to write many of the answers down without looking at the ready reckoner. He took 12½ minutes at 0·8d. with one error, and 14 minutes at 0·6, without a table (no errors).

In order to get some idea of the effect of their familiarity with the $\frac{3}{4}$d. calculations, and their unfamiliarity with 0·8d. and 0·6d., I gave the same sets of figures to a person unconnected with electricity supply and not accustomed to calculations or clerical work, and who in fact had never before used a ready reckoner. This person after I had explained and demonstrated the various methods for a few minutes, took 31 minutes for $\frac{3}{4}$d. (six errors), 16 minutes for 0·8d. (three errors) and for 0·6d., without using any table, 14 minutes (two errors).

It seems reasonable therefore to assume that given equal conditions, the time and also the liability to error could (in comparison with $\frac{3}{4}$d.) in the case of 0·8d. be approximately halved, and in the case of 0·6d. reduced to approximately one third.

### Criticisms Anticipated

Probably the first criticism of these suggestions will be that the consumer would not like it, that he cannot be expected to think in decimals. Actually I doubt very much whether $\frac{3}{4}$ does mean a lot more to the average consumer than $\frac{9}{12}$ or $\frac{6}{8}$, but in any case is it really necessary for us to go on quoting the price of electricity in such very small quantities? Is it not our chief concern (subject to the temporary fuel restriction) to get the ordinary consumer to think in hundreds of units and even thousands, and not in terms of single units. If we want the consumer to think thus, why not give him a lead by quoting prices in hundreds. Therefore instead of saying, to give a typical example, a fixed charge, plus $\frac{3}{4}$d. for each unit consumed up to 500 units in a quarter (which incidentally comes to the peculiar sum of £1 11s. 3d.) plus ½d. per unit for all units in excess of 500 per quarter, let us substitute the following:—

A fixed charge, plus a unit charge at the rate of 300 units to the £ up to 600 units per quarter, and all units in excess of 600 charged at the rate of 400 units to the £. With such a tariff, if the consumption exceeds 600 no table need be used, as the first block costs £2, and the price of the subsequent units at 0·6d. can be found without using a table by the method already described.

There are six prices available for use

between 0·3 and 0·8, and limitless variations on these can be obtained by compensating adjustments to the fixed charge item or by altering cash discounts. While some of this may not seem to have much application to large undertakings with fully mechanised accountancy systems, even here such calculations are still very much the concern of the prepayment meter collector, who has to do his calculating under much worse conditions than the office clerk. If the methods suggested here were adopted all the tables he would require could be made up in a large clear type on one small card which could be pasted inside the cover of the meter book and thus make reference an easy matter.

# PERSONAL and SOCIAL

## News of Men and Women of the Industry

TWO further additions have to be made to our list of electrical men in the New Year Honours List: they are **Mr. James Finlay,** M.I.E.E., senior engineer, Ministry of Finance, Northern Ireland, who is made an O.B.E., and **Mr. W. M. Lapper,** recently appointed district manager, Mid-East England and North-East England, by the C.E.B., who is made an O.B.E. (Military Division) for his work in connection with the restoration of electricity supply in Italy.

**Mr. A. S. Windett** has been appointed development and economic planning officer to the County of London Electric Supply Co., Ltd. A graduate of the London School of Economics and a member of the Council of the Royal Statistical Society, Mr. Windett has held positions in the Economic and Statistical Departments of B.E.A.M.A. and the C.E.B. In December, 1939, he joined the Ministry of Supply as deputy director of statistics and was later transferred to the Ministry of Production as statistical adviser.

**Mr. L. W. Smith,** B.A. (Camb.), who has recently retired from the position of managing director of Elliott Brothers (London), Ltd., had been connected with Elliott Brothers for the past forty-two years and had been managing director since 1933. From 1941 to 1943 Mr. Smith was chairman of the British Electrical & Allied Manufacturers' Association, and he was also president of the London & District Association of the Engineering & Allied Employers' Federation from 1938 to 1940. Some of his many other interests have been in

Mr. L. W. Smith

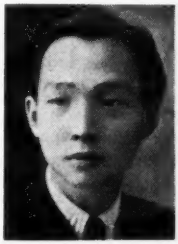
Mr. G. K. R. Lee

connection with Faraday House Engineering College, of which he is still a director, and he was during the war chairman of the Local Reconstruction Panel of the Emergency Services Organisation.

Mr. Smith, who will retain his seat on the board and be available in an advisory capacity, has moved to Devon where we hope he will enjoy his well earned retirement.

**Mr. G. K. R. Lee** succeeds Mr. L. W. Smith both as managing director and as a member of the B.E.A.M.A. Council.

**Mr. D. W. C. Shen,** the author of the article on "Complexor Representation of Electric Power" published in this issue, was educated at the National Tsing Hua University, China, and gained the B.Sc. in electrical engineering there. For some time he was engaged in ultra-high-frequency research with the Chinese National Resources Commission and then became assistant to Professor A. P. T. Sah, D.Sc. (the originator of dyadic circuit analysis) who was recently in this country as guest of the British Council.



Mr. D. W. C. Shen

Mr. Shen was for a period lecturer on electrical engineering at the National University of Amoy and then came to England under the auspices of the Federation of British Industries. He is now at the Marconi works, Chelmsford.

The British Electrical Development Association, Mid-East England Area, has made presentations to **Mr. Charles Pickering,** formerly commercial and managerial assistant in Barnsley Electricity Department for his services to the Association's Propaganda Committee.

At the annual New Year party given by the directors of Gresham Transformers, Ltd., Hanworth, attended by approximately 300 employees and their friends, **Mr. J. P. Coleman,** chairman, stated that during the war the company had made 125,000 transformers of many different types for radar and other operational equip-

C†

ment. Now that they had been released from war contracts a very strong sales organisation had been established throughout the country and he was confident that there were good prospects ahead for the whole of the organisation.

**Sir Leonard Pearce,** C.B.E., has been appointed a director of Central London Electricity, Ltd., and London Associated Electricity Undertakings, Ltd.

**Dr. P. Dunsheath,** President of the Institution of Electrical Engineers, told members of the Luton Electrical Society that he was leaving shortly for the United States to tell Americans of the tremendous amount of work done during the war by the electrical engineers of Britain. The discoveries made here, he said, would be of the greatest value in world reconstruction.

**Mr. G. H. Gould,** Assoc. M.C.T., A.M.I.E.E., chief assistant to the engineer and manager of the Chester Electricity Department, has been appointed chief assistant engineer to Central Sussex Electricity, Ltd., and associated companies.

**Dr. Harry Barron** has now left Pirelli-General Cable Works, Ltd., where he has acted as head of the Plastics Development for almost seven years, and is resuming his pre-war consulting practice in plastics and rubber. For the time being his address is: 90, Shaftesbury Avenue, Southampton (telephone: 75557.)

**Mr. J. R. Hambler** has joined Crompton Parkinson, Ltd., as instrument and meter specialist for the Midlands and South Wales areas. He will operate from the Birmingham Plant Branch Office, Crompton House, Severn Street, 1 (telephone: Midland 6351.)

**Mr. R. E. Davis, A.C.A.,** has been appointed secretary of Thorn Electrical Industries, Ltd., and its subsidiaries, and its associated company, the Ferguson Radio Corporation, Ltd. Mr. Davis has been chief accountant with the group during the past two years, and was formerly connected for ten years with the County of London Electric Supply Co.

At the quarterly meeting of the Brookhirst Comrades' Service Association (incorporating Cantie Switches, Ltd.), at Chester, presentations were made to **Mr. A. H. Cartwright** (chairman) and Mrs. Cartwright, from the committees of the B.H. Benevolent Fund and B.C.S.A. Mr. Cartwright is leaving Chester.

**Mr. F. C. Isaac** assistant electrical engineer to Plympton Council, Devon, has been appointed electrical engineer and manager to the Heckmondwike Council.

**Mr. John N. Dean,** B.Sc. (Lond.), and **Mr. Walter F. Randall,** B.Sc. (Eng.), M.I.E.E., members of the senior staff of the company, have been elected directors of the Telegraph Construction & Maintenance Co., Ltd.

**Captain W. A. Hawkes,** C.B.E., R.D., R.N.R. (ret.), has joined the Marine Cable Department of Johnson & Phillips, Ltd., Columbia House, Aldwych, W.C.2, having concluded a distinguished career with the Cunard White Star Line.

**Mr. P. W. Laverick,** M.C., A.M.I.E.E., a founder director of Switchgear & Equipment, Ltd., has severed his connection with that company.

**Mr. M. A. K. Crosby,** M.E., A.M.I.E.E., of Adelaide, who has been a member of the technical staff of the Metropolitan-Vickers Electrical Co. since 1939, is returning to Australia to rejoin the staff of the Adelaide Electric Supply Co., Ltd.

**Major R. A. S. Lane,** younger son of Mr. W. E. Lane, M.I.E.E., has been awarded the Military Cross for gallant and distinguished services in Burma.

**Mr. W. H. McFadzean,** a director of British Insulated Callender's Cables, Ltd., is to carry out executive duties as manager (financial), controlling, *inter alia,* the secretarial and financial divisions of the organisation. **Mr. F. V. Thompson** has been appointed secretary of the company and **Mr. R. Macmillan,** chief accountant.

**Mr. S. A. Hunter,** Graduate I.E.E., has joined Foster Transformers & Switchgear, Ltd., at their Birmingham office, Daimler House, Paradise Street. Mr. Hunter received his training with the G.E.C. at Witton and at Birmingham Central Technical College. After several years on the lecturing staff of the college he joined the Electric Construction Co.

**Mr. H. F. Schwarz** has been elected deputy-chairman of the Decca Navigator Co. and **Group Captain E. Fennessy** has been appointed to an executive position and has joined the board.

Southend Corporation is advertising for a borough electrical engineer and manager to succeed **Mr. A. C. Johnson** who is retiring after extended service during the war.

## Obituary

**Mr. F. Parkinson.**—By the death on Monday last of Mr. Frank Parkinson the electrical industry loses one of its outstanding figures. He had been ill for some time and succumbed to a sudden heart attack. Mr. Parkinson was born at Guiseley, near Leeds, in 1887 and was educated at the local day school and the Yorkshire College (the predecessor of Leeds University). With his brother, Mr. Albert Parkinson, he was responsible for the formation of F. & A. Parkinson, Ltd., which in 1927 merged with Crompton & Co., Ltd., to form Crompton Parkinson, Ltd., of which Mr. Frank Parkinson was chairman, as he was

**The late Mr. Frank Parkinson**

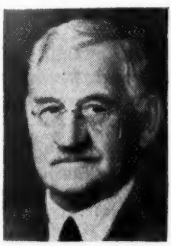
of the British Electric Transformer Co., Ltd., and Derby Cables, Ltd., which joined the group later. During the war he served as deputy director-general of contracts in the Ministry of Supply.

Mr. Parkinson was a generous benefactor to Leeds University; he gave £50,000 for the establishment of scholarships in 1936 and later in the same year £200,000 for a central administrative block. In recognition of this he was given the University's honorary degree of Doctor of Laws in 1939; he was a governor of the University. He had served on many industrial committees.

The cremation takes place privately to-day and the funeral service is to be held at Trinity Methodist Chapel, Guiseley. A memorial service has been arranged at St. Margaret's, Westminster, for February 7th at 12.30 p.m.

**Mr. C. L. Lewis.**—The death occurred on January 23rd of Mr. C. L. Lewis, M.I.E.E., electrical engineer to the Plympton Rural Council. He was found dead near a feeder box which he had apparently been inspecting. At the funeral on January 26th the Devon and Cornwall Sub-Centre of the I.E.E. and local undertakings were represented.

**Mr. F. Samuelson.**—We regret to report the death on January 21st of Mr. Frederick Samuelson, for many years chief turbine engineer of the B.T.H. Co. Mr. Samuelson, who was born in Sweden in 1866, gained scholarships at the Technical School, Stockholm, which enabled him to come to England in 1887. He worked for a year with Sir Hiram Maxim on the quick-firing gun and flying machine and for the next nine years he was with Vickers, Ltd. at Erith. He joined the B.T.H. Company in 1897, and was in charge of the Turbine Department from its inception in 1903 until 1939, when he relinquished that appointment and the seat on the board of directors which he had occupied since 1934. He then devoted his attention to consulting work until his retirement in 1941.



**The late Mr. F. Samuelson**

Mr. Samuelson was one of the pioneers in the development of the steam turbine in Great Britain, seeing it grow from the simple Curtis type two-stage velocity compounded vertical machine of 500 kW to the 75,000-kW multi-cylinder horizontal turbo-alternator as installed in Barking power station. Following the successful operation of the first 10,000-kW, 3,600-RPM extra-high-temperature (1,000 deg. F) steam turbine which the company built under his personal supervision for the Detroit Edison Company, U.S.A., came the development of the jet-propulsion gas turbine in association with Air-Commodore Frank Whittle. In 1932 the King of Sweden conferred on him the Royal Order of Nordstiernan. He was a member of the Institution of Mechanical Engineers, had served on its Council, and had been chairman of its Midland Section. He was also a member of the I.E.E.

**Mr. A. F. W. Richards.**—We learn with regret of the death, on January 25th, of Mr. A. F. W. Richards, M.I.E.E., M.Cons.E.

**The late Mr. A. F. W. Richards**

Mr. Richards started his engineering career in 1894 at the Hastings Electric Light Works where he received training in generating station and distribution system practice. From 1894 to 1901 he was assistant engineer and mains superintendent at the Reading Electric Light Works. Between 1901 and 1906 he was assistant engineer to the County of London Electric Supply Co., Ltd., in the mains and distribution departments. He then joined the Contracts Department of W. T. Glover & Co., Ltd., and from 1913 to 1919 was in charge of that department where he had wide experience in the maintenance and installation of cables of all classes in this country and in India. During this period he compiled the well-known reference book, "Glover's Vade Mecum." In 1919 he set up in practice as a consulting engineer with Mr. A. Murray Coombs. This partnership was dissolved in 1933, when he took into partnership Mr. Harold Bright, his chief technical assistant. Mr. Richards served on a number of committees of the B.S.I. and Mining Electrical Engineers. The practice will be continued at the same address by Mr. Harold Bright with the assistance of his staff.

**Mr. E. G. Baker.**—We are sorry to hear that Mr. E. G. Baker, secretary of the Provincial Electric Supply Association, publicity manager of the County of London Electric Supply Co., Ltd., and joint secretary of the Joint Committee of Electricity Supply Organisations, died suddenly on January 23rd after a short illness.

**The late Mr. E. G. Baker**

**Mrs. Anna Volk,** widow of Mr. Magnus Volk, founder of Brighton's sea-front railway, the first electric railway in the country, died recently at the age of eighty-nine.

# Cold Weather and the Grid

## Record Peak and Causes of Plant Deficiencies

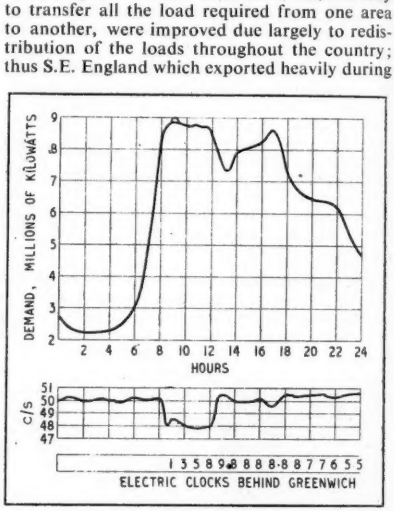
ON Monday, January 21st, the load on the grid reached the highest figure yet recorded and, as on the previous Friday when the generating capacity available was also insufficient to meet the heavy cold-weather demands, a short-period cut in electricity supplies was made in some areas. The load curve reproduced illustrates the conditions that had to be met on the Monday, and the accompanying table compares the position in regard to plant capacity (with causes of kW deficiencies) and demand with that at the time of last winter's maximum load on January 25th, 1945.

The present load curve differs somewhat in shape from that of a year ago owing to changed industrial conditions, the lifting of the black-out and the reversion to Greenwich time last September. The evening peak is more apparent, and in South-East England it now generally exceeds the morning figure. A notable feature is the rate of rise of load in the morning, when the half-hourly integrated demands starting from 2,771 MW at 6 a.m. were as follows: 3,365, 4,410, 5,818, 7,653, 8,743 and 8,859 MW reaching a maximum of 8,922 MW at 9.30 before receding slightly to 8,854 at 10 a.m. The peak would have been higher still had not the frequency at the time dropped to 47·95 cycles—quite as low as it is safe to go having regard to possible effects on station auxiliaries, which would greatly worsen the situation.

The small shaded protuberance at the top of the load curve shortly before 9 a.m., which corresponds to the rise of frequency shown in the lower curve after the shedding of 170 MW (112 MW in S.E. England from 8.40 to 9.04 a.m. and 57 MW in Central England from 8.42 to 9.04 a.m.), illustrates the relationship between frequency and output.

In amplification of the table, the term "maximum output capacity" means the rated kW of plant installed less that required for station auxiliaries and for reconciling any lack of balance between component parts of the stations. The kW given as inoperative on account of unsuitable fuel is a minimum figure, being only that known to be directly due to that cause, although plant capacity is indirectly affected in many ways. Despite a substantial reduction in the amount of plant out of commission owing to breakdowns, the proportion remains very high and taken with the figure for plant undergoing overhaul during the winter peak furnishes some measure of the inadequacy of man-power of all grades for maintenance.

Miscellaneous causes in 1945 included 3 MW damaged by enemy action as well as such items as boilers whose performances were below their rated outputs. Circuit limitations, *i.e.*, inability to transfer all the load required from one area to another, were improved due largely to redistribution of the loads throughout the country; thus S.E. England which exported heavily during the war is now importing during peaks on an even more extensive scale than it did in 1938-39.




**Load and frequency curves**

The complexity of the problems entailed in the routing of energy in emergency is illustrated by the practical desirability (and, superficially, the paradox) of opening the east-to-west links of the grid in Scotland and North of England on January 21st, the grid then being operated as a "U" with its base in the south. The increase in maximum demand of 285 MW, as compared with January 25th, 1945, was met by 183 MW of new plant plus 60 MW margin at last year's peak, the remainder being dealt with by overloading the generating sets.

EFFECTIVE GENERATING CAPACITY AND PEAK LOADS IN MW

| Year | Max. output capacity | Plant out of Commission | | | | | | Net available capacity | Max. demand |
|---|---|---|---|---|---|---|---|---|---|
| | | Unsuitable fuel | Breakdown | Overhaul | Misc. | Circuit limitations | Total | | |
| 1945 | 10,300 | 225 | 709 | 427 | 217 | 25 | 1,603 | 8,697 | 8,637 |
| 1946 | 10,527 | 241 | 599 | 441 | 347 | 19 | 1,647 | 8,880 | 8,922 |
| Difference | +227 | +16 | −110 | +14 | +130 | −6 | +44 | +183 | +285 |

An uncovenanted benefit of the grid is the maintenance of accurate time-keeping by frequency-controlled clocks. Should the fulfilment of the official functions of the Central Electricity Board necessitate temporary departures from standard frequency, compensating corrections are made as soon as practicable with a view to securing correspondence with the Greenwich time signal in the 8 o'clock news each morning. There is accordingly no need for the owners of such clocks to make double adjustments of the time, which will right itself automatically.

Weather forecasts are worked out by the C.E.B. three times a day and arrangements have been made with the B.B.C. through the Ministry of Fuel to broadcast warnings in the midnight, 7 a.m. and 8 a.m. news bulletins when meteorological conditions have shown a need for especial care in the use of electrical apparatus in order to avoid the possibility of curtailment of supplies.

# Parliamentary

By our Special Reporter

### Shortage of Plugs

IN the House of Commons on January 22nd, Sir Charles Edwards asked the Minister of Works if he was aware of the shortage of electric power plugs in South Wales and Monmouthshire; and whether, as this shortage would delay the completion of projected building schemes, he would take steps to rectify it.

Mr. Tomlinson said he was aware of a shortage in several parts of the country of certain types of power plugs and switches. The Minister of Supply and Aircraft Production was doing his utmost to increase production.

### Future of Television

Answering questions by Mr. P. Freeman the Minister of Information said that the date of the reopening of the public television service from Alexandra Palace was under discussion with the Radio Industry Council and others concerned. It was expected that it would be reopened in a few months. The service would use the same frequency and transmission characteristics as before the war, but advantage would be taken of certain transmission improvements which involved no essential change in existing receivers. A still pattern service for the benefit of manufacturers of receivers would begin on February 1st. The Television Advisory Committee was examining the question of the extension of the service to the provinces.

### East Anglian Scheme

Replying to Mr. E. Granville, Mr. Shinwell (Minister of Fuel and Power) said that under development proposals approved by the Electricity Commissioners in 1938 under Section 28 of the East Anglian Electricity Act, 1927, the East Anglian Electric Supply Co. was required to carry out compulsory works in four parishes in the Rural District of Blyth and five in the Rural District of Hartismere. In addition, transforming substations were to be provided in eight parishes in Blyth and eight in Hartismere. All this work, and substations, had been completed, with the exception of one transforming substation at Bacton. An application for his consent to the placing of certain overhead lines in connection with the scheme for affording supplies to farms at Bacton, was submitted by the company on January 16th. The local authority had the right to be heard, if desired, before his consent was issued. Evidence on this point had not yet reached him, but as soon as it was received, the application would be dealt with.

### Wireless Licence Fees

Mr. Williams stated that the Government had decided that the charge for the licence to receive sound broadcasts should be increased from 10s. to £1 a year at a fairly early date. A new licence would be introduced covering both television and sound reception at a charge of £2 a year.

# Transatlantic Discussion

MR. PERCY GOOD presided at the special "transatlantic" meeting of the Institution of Electrical Engineers on Thursday last week which was referred to in last week's issue. He mentioned that simultaneously the American Institute of Radio Engineers was meeting in New York and part of the proceedings of the two meetings would be conducted by radio across the Atlantic.

Mr. J. A. Pierce then read (in New York) an abstract of his paper on hyperbolic navigation and a recording of greetings from the President of the I.E.E. (Dr. P. Dunsheath) was then transmitted in the opposite direction. Dr. Dunsheath said that he hoped to make personal contact with many American engineers during his visit to the United States in a few weeks' time. Dr. Llewellyn, President of the American Institute of Radio Engineers, responded, Mr. A. H. Mumford, chairman of the I.E.E. Radio Section, then followed with greetings from his Section and an expression of thanks to Mr. Pierce, who replied.

Upon the conclusion of the transmissions Mr. Good thanked those responsible—the G.P.O. and B.B.C. here and the American Telegraph & Telephone Co. in the United States. He went on to say that the President and secretary of the Institution would soon be going to Canada to attend the Congress of Canadian Engineers and they would also visit New York. He wished them a comfortable journey and a safe return.

The general discussion on Mr. Pierce's paper was resumed, the speakers being Group Captain E. Fennessey, Dr. R. L. Smith-Rose and Air Commodore W. C. Cooper.

# CORRESPONDENCE

*Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.*

## High-speed Turbo-alternators

DURING the discussion at the Institution of Electrical Engineers on the paper by Messrs. Coates and Pyle reported on page 868 of your December 14th, 1945, issue, a statement is reported to have been made by Mr. C. W. Priest that a turbo-alternator installed at Battersea in 1931, was, he believed, the first 30,000-kW 3,000-RPM unit to be put to work in this country.

In this, however, Mr. Priest is mistaken: a turbo-alternator of this rating and speed was put into commercial service in the power station of the West Ham Borough Council on March 23rd, 1930. The alternator is a two-phase machine so that the physical dimensions are rather larger than those of a three-phase machine of the same output.

Up to December 31st, 1945, this set had generated 1,457 million kWh, had run for 77,615 hours, had been stopped and started about 4,000 times and had never given the slightest indication of rotor copper shortening or any other electrical trouble in either rotor or stator. No special precautions, such as pre-heating or conserving heat when shutting down, are taken.

*Stratford, E.*15. J. W. J. TOWNLEY,
*Engineer & Manager*,
West Ham Electricity Department.

## Hire or Hire Purchase?

I WAS very interested to read your leaderette on the above subject. My own inclination has for many years now been in favour of hire-purchase rather than simple hire for those appliances in which the maintenance can be unduly high where this is affected by consumers' negligence. This is particularly applicable to cooking appliances. With the present price of electricity from the grid there is no scope for subsidising the loss in simple hire from the profits made on the sale of current. Consequently there is a stronger demand that simple hire, if continued, should stand on its own.

For this reason my Board has agreed in future to offer cookers on hire-purchase over a ten-year period with free maintenance throughout that period. I feel that the consumer who obtains a cooker on these terms will take much more care of it than if it were one obtained on simple hire, and the actual cost to the consumer will be comparable with the economic cost of hiring these appliances.

I am enclosing a circular letter which I have sent out to all builders and electrical contractors operating in this Board's area of supply calling attention to this new offer.

*Wilmslow.* C. CAMERON KIRBY,
*Engineer and Manager*,
Alderley Edge & Wilmslow Electricity Board.

[In the course of the circular letter to which Mr. Cameron Kirby refers it is stated that the Board will lay a free service cable along the route of existing mains, up to a length of 50 ft. in all cases where the premises are wired for a cooker, and in addition, where approximately 75 per cent. of the rooms are wired for a 3-kW socket-outlet. In general this means that wiring of not less than 7/·029 should be used to supply each outlet, and where more than one outlet is supplied from the same circuit this section should be increased. The wiring to cookers should be of not less than 7/·044 and should be terminated at the service end with a 30-A double-pole switch and fuses, and at the cooker end with a cooker control switch.

To assist new consumers to purchase electric cookers, the Board offers its standard cookers on hire-purchase on a ten-year basis, free maintenance being given throughout that period. All these cookers will be fitted with thermostatic oven control and Simmerstat control of one hot-plate. The actual terms for these cookers may be obtained on application. The general principle adopted in ascertaining these terms is to add 27½ per cent. to the list price and divide the result by 40, the resultant figure giving the quarterly hire-purchase charge.—Editors, *Electrical Review*.]

## Electricity Supply Clerical Staffs

LOCAL authority clerical staffs are generally paid according to standard scales applicable to every department irrespective of the nature of the work; these scales should allow for the varying nature of the work entailed and in trading departments, they should be negotiated on a Whitley basis as in the case of most technical staffs and weekly-paid employees.

In the case of electricity staffs an Electricity Supply Clerks' Association might be formed together with a National Joint Board to look after both local authority and company clerical staffs. These bodies would have to receive recognition from the Ministry of Labour as an arrangement for the settlement of disputes by conciliation or arbitration,

and all electricity supply clerks should be persuaded to become members of the Association to secure maximum strength for negotiation purposes.

The Association could also institute examinations which would provide a suitable qualification when applying for such positions as commercial assistant, chief clerk, senior accountant or secretary. The examination should provide for the following subjects:—Electricity supply law; economics, with special attention to electrical engineering economics; general commercial law; local government law and procedure or (for clerks in company undertakings) company law and practice; and accountancy with special sections on costing and hire purchase, municipal accounts or company accounts.

*Birkenhead.* W. E. BOSTON.

## Earth Connections

IN an editorial note in your issue of January 18th you suggest that in the absence of a testing switch or link in the earth-and-neutral connection of an AC system, clip-on ammeters should be used to determine leakage. These ammeters are not generally available to give full-scale readings with less than 50-A turns between the tongs. This means that unless pre-formed coils are inserted in the neutral-earthing lead, a current of less than 10-A would not register on the usual clip-on ammeter.

On all except the largest systems, leakage of this kind would be most unusual unless there were an actual fault on the mains and I would therefore suggest that the clip-on ammeters would not be of much use for the purpose you mention.

*Cirencester.* A. J. CAUNTER.

## Plugs and Sockets

THE article on "Plugs and Sockets" by Mr. J. F. Field, in your issue of January 18th, contains a statement which is not wholly correct in its implication.

Referring to a new design of 13-A plug and socket recently tested at the Institution of Electrical Engineers along with some BSS 546 5-A plugs and sockets, your contributor stated that Press reports indicated that in carrying 13 A the fused pin became hotter than he considered desirable. All the reports I have seen state that the test was done at 15 A which represents an overload of 15·4 per cent. on its current rating of 13 A. It is reasonable to suppose therefore that the temperature rise of the fused pin at its proper current rating would not be unduly great, and, in fact, available information shows that it is about 17 deg. C. Further, it seems that this figure is not noticeably affected even when the fused pin is screwed only half home.

*Mellor, Nr. Stockport.* A. R. ASTBURY.

MR. J. F. FIELD'S excellent article on plugs and sockets at last puts this matter on a rational basis.

The points that have been overlooked in previous articles are:—(1) Small houses constitute the vast majority of dwellings in this country. (2) A 3-kW fire is much too big for the small-house room. It is in the small house that "skimping" and "cheeseparing" of electrical installations takes place and it is here that a standard plug would be a boon.

But why Mr. Field's last sentence? Surely that gives away the whole position. If a fitting takes more than 10 A it should be made a permanent installation. It is high time electrical engineers insisted on this. Besides clarifying the plug position this would make for greater safety. A 3-kW fire can be a dangerous piece of apparatus; it should not be possible to move it up against a piece of furniture.

*Chester.* DENIS WILLIAMS.

## Water-Heater Control

THERMOSTATIC control of household circulators, whilst usually satisfactory in operation, tends to cause excessive consumption of electricity. Cylinder and pipe losses may account for up to 10 to 15 kWh per day with unlagged cylinders and from 3 to 5 kWh even with effective lagging.

If water heating is to become popular with working-class consumers it is essential to reduce this consumption, and yet at the same time give reasonable supplies of hot water.

The principal of the thermostat is such that the water temperature only is under control and this is entirely unrelated to quantity. Now the domestic consumer is not concerned whether the temperature is 120 or 180 deg. F. so long as hot water (say 120 deg. and upwards) is available in quantities sufficient to meet his many varied requirements. The ideal arrangement would be to have an automatic device that enabled a pre-selected quantity of hot water to be obtained as and when required. A simple solution would be to have, in place of the thermostat, a preselector control switch by which the heater could be switched on for varying periods up to say 2 to 2½ hours. A device of this nature

would consist essentially of a simple timing mechanism, either spring-controlled with escapement or operating on the synchronous-clock principal working in conjunction with a simple switch mechanism. Among the advantages of this arrangement over thermostat control would be :

Operation on a quantity and not temperature basis; maximum economy in the use of the heater, which could not be left in circuit for longer than the maximum setting of the time switch; the circulator could be designed and fitted in the cylinder in such a position as to give the maximum delivery of hot water to the top of the cylinder, which is not possible under thermostatic control unless the thermostat is given an abnormally high setting, thus considerably increasing the losses; installation costs may be reduced, as the device would cost no more than a thermostat, and in addition the hand-control switch and possibly the lagging jacket could be dispensed with; as the switch contacts would be required to operate only once or twice daily, the possibility of contact trouble would be remote, whereas with the thermostat, they are opening and closing continuously when in use; unlike thermostatically controlled heaters, which are continuously switched on and off whilst in use, time-switch-controlled heaters would be on for a limited period only, so that the diversity of the load would be very much higher.

As the device operates on a quantity principal, perhaps a suitable name for it would be the "Quantistat." A satisfactory device has now been produced by one of the leading manufacturers. Comments are invited.

DANIEL ROSS,
*Paisley.* *Engineer and Manager.*

## Technicians for the Mines

YOUR correspondent Mr. Ross is without doubt quite correct in saying that there is no inducement for young men to endeavour to improve their technical knowledge in the electrical side of mining and exactly the same conditions are found in such concerns in the mechanical engineering industry in cases where say 80 per cent. of the work is mechanical and the balance electrical.

A case in point is one where some ten electricians—about 5 per cent.—are employed fitting motors, starters, heating platens, relays, photo-cell controls, etc., work which requires a high degree of skill and technical knowledge but these men are ranked on the same level as engineers' fitters who by means of bonus systems can often augment their basic rate by from 30 to 50 per cent. The electrical work, however, is so varied that it is quite impossible to arrange bonus rates.

The fault lies in the agreements arrived at between the trade unions and the employers' protective associations who seem to place technical skill at a discount. Unless something is done to correct such a mistaken impression we shall soon again revert to the pre-war condition of good men leaving manufacture and production to become salesmen, etc.

CHARGE ELECTRICAL ENGINEER.

## Choice of Textbooks

WITH regard to recent references in your columns to textbooks, I wish to purchase some dealing with installation and maintenance work from the practical angle. Advice from your readers would be thankfully received. "B.A.O.R."

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# New Scottish Schemes

THE North of Scotland Hydro-Electric Board has published Electricity Distribution Schemes, No. 4 (Bute, South Cowal and Great Cumbrae) and No. 7 (North Cowal), and Hydro-Electric Constructional Scheme, No. 4 (Cowal) to supply both the Distribution Schemes. The Royal Burgh of Rothesay, which adjoins the area of the scheme, already has an electricity undertaking which the Town Council is to transfer to the Board on May 15th. Dunoon, too, adjoins the scheme. Electricity is supplied there by the Dunoon & District Electricity Supply Co. A bulk supply of electricity will be provided for Dunoon, if required. Twelve places will be served by the North Cowal Distribution Scheme.

Electricity for both these distribution schemes, which cover 354 sq. miles, is to be provided under the Board's Constructional Scheme No. 4. by a 6,000-kW power station at the head of Loch Striven operating under a head of 400 ft. The reservoir will be in Glen Tarsan. Ultimately the North Cowal Scheme may also be linked with a projected generating station near the head of Loch Fyne. In view of the time required to construct a hydro-electric station, supplies will to start with be provided in some localities from the existing oil engine generating station at Rothesay. The Island of Bute and Great Cumbrae will be served by submarine cables. When the water power is available, charges for domestic supplies will be approximately 5d. per kWh for the first 30-36 kWh per room per annum, ¾d. for the next 270-324 kWh, and ½d. for all additional supplies.

# COMMERCE and INDUSTRY

## Investment and Loan Guarantees. L.N.E.R. Electrification.

### Control of Investment

THE text of the Investment (Control and Guarantees) Bill was issued last week, together with a White Paper (Cmd. 6726) explaining the purposes of the Bill and containing a draft of the Investment Control Order to be made under Clause 1. The main object of Clause 1 is to provide for Treasury regulation of the borrowing and raising of money in Great Britain.

The Bill aims at ensuring priority for projects of capital development which are of the greatest importance in the national interest. It is proposed to retain both the Capital Issues Committee and the Public Works Loan Board and their activities and those of the two industrial and commercial finance organisations will be linked with the operations of the Bank of England and with the Government's planning of the investment programme as a whole. For this purpose a National Investment Council is to be formed consisting of the Governor of the Bank of England and other financial and economic experts.

Clause 2 of the Bill empowers the Treasury to guarantee loans up to £50 million in any financial year " where they are satisfied that it is expedient in the public interest to do so for the purpose of facilitating the reconstruction of an industry or part of an industry." Copies of the Bill and the White Paper (2d. each) can be obtained from the Stationery Office.

### Television Tests

To assist the radio trade in the production, testing and servicing of television receivers, the transmission of a still pattern from the London Television Station at Alexandra Palace will start on February 1st. Transmissions will be made on weekdays from 11 a.m. to noon and from 4 p.m. to 5.30 p.m., and will consist of a tuning note and interval signal on the sound channel of 41·5 Mc/s (7·23 metres) and a still pattern of a black cross on a white background on the vision channel of 45 Mc/s (6·67 metres). The date of the opening of the public television service from Alexandra Palace will be announced later.

### Industrial Spectroscopic Group

An Industrial Spectroscopic Group has been formed under the auspices of the Institute of Physics, with Mr. F. Twyman, F.Inst.P., F.R.S., of Adam Hilger, Ltd., as chairman and Mr. E. H. S. Van Someren, of Murex Welding Processes, Ltd., as hon. secretary. The following were elected to serve as the first Committee: Lt.-Comdr. J. Convey (Admiralty Laboratory, Sheffield), Mr. B. S. Cooper (Research Laboratory, General Electric Co., Ltd.), Professor H. Dingle (Imperial College, London), Dr. A. G. Quarrell (British Non-Ferrous Metals Research Association), Mr. E. W. H. Selwyn (Research Department, Kodak, Ltd.), Mr. D. M. Smith (Johnson Matthey & Co. Ltd.), Dr. S. D. Steele (Babcock & Wilcox, Ltd., Glasgow), and Mr. A. Walsh (British Non-Ferrous Metals Research Association). Membership of this and other subject groups of the Institute is open to all interested, non-members of the Institute of Physics for a nominal fee. Further particulars may be obtained from the Secretary, Institute of Physics, 19, Albemarle Street, W.1.

### Scottish Electricians' Wages

Following upon recent negotiations between the Electrical Contractors' Association of Scotland and the Electrical Trades Union it was agreed that the hourly rate for journeymen electricians should be 2s. 4½d. as from January 1st, this rate to continue in force for the whole of this year. The hourly rates for apprentices are as follows:—First year 4¾d.; second year 7d.; third year 9½d.; fourth year 11¼d.; fifth year 1s. 2¼d.

### Rehabilitation at the L.S.B.

In discussions on lighting efficiency emphasis is constantly laid upon the necessity for maintaining the reflection factor by keeping walls and ceilings clean and bright. It would be expected

**The Lighting Service Bureau staff at their spring cleaning**

that at the Lighting Service Bureau, if anywhere, this precept would be faithfully observed, but lack of labour during the war years has made it difficult. Faced with the necessity of having things in proper order for the 42nd Illumination Design Course which starts on February 5th, the staff of the Bureau recently took the matter in hand themselves and gave the premises a

thorough spring cleaning. The illustration shows some of them at work. The acting manager, Mr. E. B. Sawyer, is seen standing by a pair of steps bearing Mr. T. Freeth, while Mr. A. D. S. Atkinson approaches the ceiling with bucket in hand.

## L.N.E.R. to Resume Electrification

The London & North Eastern Railway Company announces that instructions have been issued for the work of electrifying the Liverpool Street and Fenchurch Street to Shenfield lines to be resumed and pressed forward as rapidly as the availability of labour and materials will permit. The electrification will be carried out on the DC 1,500 V overhead conductor system, as this is equally suitable for heavy main line and dense suburban services. During 1938 the L.N.E.R. placed large contracts for the conversion of the lines, a total distance of 25 route miles. The section of line from Liverpool Street comprises four tracks and in addition to the main line services carries a heavy suburban traffic to Ilford, Gidea Park and other stations to Shenfield.

On the outbreak of the war these works and the construction of 276 new electric coaches had to be suspended.

## Electricity in the Home

Electricity in the home will be largely featured in the Modern Homes Exhibition at the Dorland Hall, Regent Street, London, W.1, which opens on March 26th. The British Electrical Development Association will be showing a new electric kitchen, designed by Mrs. Darcy Braddell to be not only the kitchen but also the woman's work room. It is divided into two bays—the cooking bay and the sewing bay. The former has all the equipment that should be found in the up-to-date kitchen including a horizontal cooker, built-in refrigerator, a sink unit including a water heater and an electric washing machine under a removable draining board, an electric fan, a drying cabinet, an extract fan and a standard service unit. The sewing bay shows an electric sewing machine and iron, an ironing board, a cutting-out table and a radio. In addition there will be a special exhibit showing the uses of incandescent, fluorescent and ultra-violet lighting. The Ministry of Supply will be showing many of the household goods for which it is now responsible and which include electric fires, stoves, immersion heaters, meters, switches, thermostats, washboilers and auxiliary water heaters.

## Indian Consulting Service

Last week Mr. R. L. Fitt, B.Sc., senior engineer of Sir Alexander Gibb & Partners, and Mr. J. C. Lithgow, A.M.I.E.E., senior electrical and mechanical engineer of Kennedy & Donkin, arrived in Calcutta to establish a new joint venture in India. They are to be the first representatives of Associated Consulting Engineers (India), a group of qualified British consultants, whose advice will be placed at the disposal of States, Governments, and industry in planning the industrial and economic development of India. The new group comprises five member firms and co-consultants, offering an organisation capable of dealing with all types of projects in civil engineering, electrical and mechanical engineering, metallurgy, irrigation, mining, chemical engineering, geology, and aerodromes and airports. Messrs. Fitt and Lithgow will shortly go to Bombay, where the offices of the group have been established, but before doing so will have discussions with Mr. H. M. Matthews, Electrical Commissioner to the Government of India. They will be joined in these discussions by Sir Lewis Fermor, O.B.E., the distinguished British consultant in geology, mining and metallurgy.

The idea for the establishment of the group resulted from a recent visit to India of Mr. Geoffrey Kennedy, M.A. The services offered embrace the preparation of project reports, including estimates of cost; preparation of detailed designs, specifications, bills of quantities and necessary drawings for obtaining tenders; advising on tenders; placing contracts; and, in the case of very large projects, the direct supervision of the work itself. Although this is a purely unofficial venture, it has the approval of leading members of the British Government.

## Simplified Patent Extension Procedure

The text has been published of a Bill providing for the amendment of the existing Patents and Designs Acts in a number of respects. It is proposed that patentees who have suffered loss or damage through the war shall be able to obtain extensions of their patents by application to the Comptroller instead of to the Courts. The Comptroller is also empowered to refuse applications for the protection of German and Japanese inventions made during the war period. Inventions or designs communicated under arrangements with other countries will be protected.

## Electricity Supply Regulations

Supplement No. X to the "Summary of the Emergency Statutes, Regulations and Orders Affecting the Electricity Supply Industry" is now available. The Summary is the work of Mr. Leslie Gordon (London J.E.A.) and Mr. J. W. Simpson (I.M.E.A., from whom copies of the supplement can be obtained at 4s. each), assisted by Mr. F. Newey (Lincoln). The new supplement covers all the regulations, etc., issued between the date of the last one and December 31st last and a complete index to the whole series is provided.

## Gauge and Tool Exhibition

Twenty-five thousand persons visited the exhibition held recently by the Gauge & Tool Makers' Association, and the home and export orders and inquiries received by the exhibitors already exceed a total value of £250,000. The possibility of holding the exhibition annually will shortly be considered by the Association.

## Coal Bill Criticised

Criticising the Coal Industry Nationalisation Bill at a meeting of the Stourbridge Civic Society last week, Mr. C. Heathcock (managing director, Midland Electric Corporation for Power Distribution, Ltd.) said that the Bill did not give the consumer anything like the protection now enjoyed in the purchase of his electricity supply.

From the consumers' point of view there were certain obvious defects. No statutory obligation rested upon the Board to supply coal of a given standard to meet consumers' requirements.

There were no adequate price structure provisions, nor provisions for appeal on prices to any impartial tribunal. No protection was afforded against preferential terms and conditions of supply. There was no requirement that any surpluses should be used for the benefit of consumers and there were no provisions to safeguard other fuel and power industries against unfair competition by the State.

Mr. Heathcock mentioned that under a protective section in the 1926 Electricity Act, electricity was purchased at 10 per cent. below the regional tariff and that over £70,000 a year was returned to Midland Electric Corporation consumers. Was it unreasonable, he asked, to request M.P.s not to support any change of ownership and control of great industries unless consumers were similarly protected. He considered that the procedure should be to concentrate every energy on putting broken industries on their feet again, so that necessary supplies should flow to the public in greater volume, rather than taking the time of Parliament in an endeavour to apply a political theory to an industry in full and robust health, with a good record of progress and efficient service.

## Contract for Irish Scheme

The Electricity Supply Board of Eire has announced that, after examination of competitive tenders, it has awarded the contract for civil construction works on the River Erne, to the Cementation Co., Ltd., Doncaster. The major part of the development of the River Erne, as planned by the Board, is scheduled to start in March. The amount of the contract is approximately £1,250,000 and the works comprise the building of two dams and two power stations on the river between Belleek and Ballyshannon, the construction of water retaining embankments and the construction of a tail race in the river bed between Cathaleen's Falls station and the estuary at Ballyshannon. It is estimated that this scheme will take three years to complete and that it will give employment to about 1,000 workers. It will involve the excavation of approximately 500,000 cu. yd. of rock. In connection with the Erne scheme the E.S.B. recently acquired the electricity undertakings in Ballyshannon and Bundoran of Major S. Myles, ex-member of the Dail.

## Overseas Economic Policy

A Joint Trade Committee of the Association of British Chambers of Commerce and the Federation of British Industries has been set up to act as a liaison committee with a view to formulating over the widest possible field a joint national policy on overseas economic questions.

## G.W. Communications System

Reorganisation of the whole of the telephone and telegraph system of the Central Wales division of the G.W.R. is now being carried out. The work involves the provision of four new telephone exchanges at Barmouth, Portmadoc, Aberystwyth and Builth Wells; enlargement of the exchanges at Oswestry and Moat Lane; installation of some 275 modern telephones; and repoling and rewiring some 358 miles of line, which will require 3,333 new poles, 13,330 telegraph arms, 38,500 porcelain insulators, 1,400 miles of line wire and 13,000 yards of cable. Long-distance telephones of the most modern type will be provided between Oswestry and Barmouth and Aberystwyth. Direct railway trunk lines will link up the various telephone exchanges. The scheme is estimated to cost £141,500.

## Copper and its Alloys

When the Services Schedule of Non-ferrous Metals and Alloys (STA.7) was first issued three years ago it included the general requirements for all materials with a section on copper and its alloys. A rationalised revision of the latter section is now available (reference PD.402) systematically grouped according to the general plan, but with the addition of more alloys and other amendments. Copies are obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. each.

## Brazilian Motor Imports

The Bank of London and South America reports in its *Fortnightly Review* that at a recent meeting of the directorate of the Associaçao Comercial of Rio de Janeiro, the action of the Brazilian authorities in refusing to issue licences for the importation of three-phase motors up to 75 HP was strongly deprecated. Local manufacturers have maintained that they can supply the local demand for motors of this type and of quality as good as that of American and other motors. The price of locally-made motors, however, is about twice that of the American article, and the latter are up to 30 per cent. dearer than European motors. The Associaçao Comercial decided to petition the Import and Export Bureau of the Bank of Brazil to reverse its decision and to permit entry of the motors in question.

## Amplifiers for U.N.O. Conference

At the Central Hall, Westminster, where the United Nations' Organisation is holding its conference, Standard Telephones & Cables, Ltd., have installed and are operating six separate sound amplifying installations.

## The Aslib Microfilm Service

Though the end of the war has reduced the demand for the Aslib microfilm service, the Association of Special Libraries and Information Bureaux, 52, Bloomsbury Street, London, W.C.1, will continue to handle documentary reproduction.

## Trade Publications

**British Thomson-Houston Co., Ltd.**, Bridle Path, Watford Junction, Herts.—Illustrated leaflet describing " Mazdalux " magnetic control components for 250-W and 400-W horizontal " Mercra " (MA/V) lamps.

**Trix Electrical Co., Ltd.**, 1, Maple Place, Tottenham Court Road, London, W.1.—Priced and illustrated leaflet detailing a range of sound amplifying and reproducing equipment, including the " Intervox " two-way communicator.

**G. & J. Weir, Ltd.**, Cathcart, Glasgow, S.4. Illustrated folder (No. 136) briefly describing refrigerating machinery, methyl-chloride and

freon, motor or steam-engine driven, for marine and industrial purposes.

**Ardente Acoustic Laboratories, Ltd.,** Guildford, Surrey.—Price list and series of illustrated leaflets describing a range of sound amplifying equipment and public address systems for a variety of purposes.

**Churchill Machine Tool Co., Ltd.,** Broadheath, near Manchester.—Illustrated pamphlet (SP.5/R) dealing with splineshaft grinding machines of various types.

**Nevelin Electric Co., Ltd.,** Purley Way, Croydon, Surrey.—Illustrated and priced booklet dealing with the " Nevelector " rectifier for cinematograph projectors.

Applicants for these publications should write on their firms' business notepaper.

## American Midget Washers

Small portable electric washers which may be stored in kitchen cupboards, broom closets, etc., are being introduced in America for flat and apartment dwellers. They weigh from 15 to about 50 lb., and measure from 15 to 30 inches in their longest dimensions. Prices range from $27·50 to $35.—*Reuter.*

## Steel Corrosion

Efforts are being made to establish a means o testing any protective treatment against corrosion for light-gauge steel and wrought iron used in permanent building construction. Pending the completion of this work and the issue of a relevant standard, a memorandum (PD.420) has been prepared for general guidance. It describes various methods of protection and recommended precautions. Copies are obtainable for 1s. each from the British Standards Institution, 28, Victoria Street, London, S.W.1.

## A.S.E.E. Annual Dinner

This year the Association of Supervising Electrical Engineers is to revert to its pre-war practice of holding an annual dinner and reunion (instead of the wartime annual luncheon). The dinner is to be held at the Connaught Rooms, W.C.2, on April 5th and full particulars will be announced later.

## Calendars

An attractively coloured picture drawing attention to the fact that with a " Goblin " vacuum cleaner in the home there is more leisure appears on the calendar of the British Vacuum Cleaner & Engineering Co., Ltd. The monthly sheets include in small type the preceding and following months.

A neat desk calendar has been received from the Davenport Engineering Co., Ltd.

## Winter Trading Co., Ltd.

With reference to the change of name of Winter Electric, Ltd., to Northwin, Ltd., we are asked to state that this will in no way affect the business and trading of the Winter Trading Co., Ltd., 6, Harrow Road, London, W.2.

## Dissolution of Partnership

M. J. Malarick and C. J. Martin, registered electrical contractors, 34, Northcote Road, West Croydon, have dissolved partnership.

# Purchase Tax Notices

**Liability in Respect of Surplus Stores.**—The Commissioners of Customs and Excise have announced that surplus stores, new or used, disposed of by Government Departments are not exempt from purchase tax and registered persons are liable for tax in the ordinary way when they sell such goods or appropriate them for retail trade or other taxable purposes. Registered persons buying such goods as stock for resale or materials for manufacture should accordingly make the usual representation to that effect in order to obtain the goods at a tax-inclusive price.

In certain cases, however, these goods will be sold at a tax-inclusive price to both registered and unregistered buyers. In this case the buyer may obtain from the Department concerned a certificate to this effect. Separate accounts must be kept of such goods and they must be resold in the same condition, apart from necessary repairs. If they are made up into another class of article the tax will have to be paid on the latter in the ordinary way. Goods for manufacture or export should be bought under the tax-exclusive purchasing arrangements as should goods requiring extensive repair or reconditioning, when tax will be payable on the value after reconditioning. Surplus stores sold by local authorities will normally be sold on the tax-inclusive basis.

**Organ Blowers.**—The Treasury states that it proposes from a date to be specified to remove the purchase tax on centrifugal organ blowers. Any representations on the subject should be made by February 8th to the Commissioners of Customs & Excise, City Gate House, Finsbury Square, E.C.2.

# Ilford Tube Railway

DIFFICULTIES surmounted in the construction of the new Ilford tube railway, which cost £2,870,000, were described by Mr. G. L. GROVES, of Mott, Hay & Anderson, consulting engineers to the L.P.T.B., in a paper which he read before the Institution of Civil Engineers last week.

To avoid a great upheaval complicated by diversion of mains and disturbance of heavy traffic, the whole of the widening of Mile End Station was carried out from below—in effect, by underpinning the roadway. At one point near Mile End Station there was only about 9 ft. of ballast between the crown of the running tunnel and the foundations of a bank strongroom directly above.

In addition to constructing the New Ilford line, re-alignment work and re-tracking of the old Central line was carried out at night during non-traffic hours, and when this work reached its peak gangs were operating at nearly 30 separate points.

All stations from Shepherds Bush to Liverpool Street were lengthened.

# ELECTRICITY SUPPLY

## Stratford-on-Avon Inquiry. Purchase Periods Extended.

**Altrincham.**—EXTENSION OF TIME.—The Electricity Commissioners have made the Altrincham Electricity (Extension of Time) Order, 1946. This continues for a further year the period ending June 29th, 1946, within six months after which the local authorities concerned may purchase those parts of the undertaking authorised by the Altrincham and Bowdon Electric Lighting Order, 1893, and the Extension Order of 1912 which are within their jurisdiction.

**Bexhill.**—SHOWROOMS.—The Electricity Committee is to adapt premises in Devonshire Square as showrooms at a cost of £200.

**Brighton.**—DEVELOPMENT WORK.—The Electricity Committee is to supply electricity to 180 houses at the Whitehawk estate (£7,625); erect substations in Whitehawk Road (£3,605) and Lower Bevendean (£3,225); and increase the capacity of various substations (£4,570).

**Croydon.**—OPERATION OF CREMATORIUM.—The cemetery superintendent has reported that the two electric furnaces at the crematorium were overhauled last year and are operating satisfactorily. Over 4,000 cremations have now been carried out; it is considered that the recuperators should be overhauled after every 2,000 operations. During the past year there were 813 cremations and the electricity consumption was 26,845 kWh, an average of 33kWh per cremation, as compared with 29kWh in 1944, which is said to have been the lowest consumption ever recorded for an electric cremation furnace.

YEAR'S SURPLUS.—The Electricity Committee reports a surplus for the year of £56,606 of which £9,106 is to be devoted to rate relief.

SUPPLY TO ESTATE.—The Corporation Electricity Committee is to provide a supply to the Heathfield estate, involving the erection of two substations, at a cost of £17,321.

**Fulham.**—REMOVAL OF PROTECTIVE WORKS.—Referring to the negotiations which have been in progress with the Electricity Commissioners for some months past with a view to a grant being obtained towards the cost of removing the Civil Defence protective works at the power station, the Electricity Committee says it is advised that a grant will not be allowed as the demolition work cannot be regarded as capital expenditure. It recommends that the work shall be commenced immediately so that the staff will not have to work during another summer with inadequate ventilation and under black-out conditions. The cost cannot be accurately estimated, but it is thought that it will be between £20,000 and £40,000.

MAINTENANCE OF BOILER GRATES.—During last autumn extensive damage was done to the grates of the power station boilers owing to the poor quality of the fuel supplied. The cost is assessed at £4,500 and the Electricity Committee recommends that a payment of £4,000 shall be made to Taylor Stoker Co., Ltd., with whom a maintenance agreement is in force.

GAS-WASHING EXPERIMENTS.—The Electricity Committee reports that the Electricity Commissioners have agreed to experiments being resumed in connection with gas washing at the power station and the Committee recommends an expenditure of £25,000 for this purpose.

YEAR'S PROGRAMME.—A statement of capital expenditure during the twelve months from April 1st next which has been submitted to the Council includes the following by the Electricity Committee:—Power station extension and colliers, £950,000; and showrooms, offices, mains, reorganisation equipment, etc., £149,000.

LIBRARY LIGHTING.—The Libraries Committee has had under consideration the provision of improved lighting in the libraries and recommends, as a first step, the installation of fluorescent lighting at the West Kensington library.

**Liverpool.**—RESTORATION OF STREET LAMPS.—Because of deterioration and wilful damage during the war, practically every street lamp fitting has required renovation or renewal. So far 11,580 electric street lamps have been relighted out of a total of 18,000.

**Malton (Yorks).**—SUPPLY TO THIXENDALE.—The Buckrose Light & Power Co. Ltd. is to start work as soon as possible on the supply of electricity to the village of Thixendale and surrounding farms.

**Middlesbrough.**—PROPOSED EXPENDITURE.—Capital expenditure to be incurred by the Corporation Electricity Department this year will amount to nearly £68,000.

**Mid-Lincolnshire.**—RURAL EXTENSIONS.—The Mid-Lincolnshire Electric Supply Co. proposes to supply during this year the villages of Anwick South Kyme, Aigarby, Howell, Evedon, Ewerby and Osbournby.

**Padiham.**—ELECTRICITY CHARGES.—Recently the Council decided to increase fixed charges by 10 per cent. The Electricity Commissioners withheld consent putting forward the view that any increase should apply to all scales and not fixed charges only. The Committee is now considering an increase of all charges.

**Salford.**—APPARATUS REQUIREMENTS.—The Light, Heat and Power Committee has given authority for the purchase in the open market on the best terms obtainable of the following goods in the year to March 31st, 1947 :—Meters, cookers, fires, water heaters, washboilers, kettles for use with cookers, ironclad switches and service fuse-boxes.

**Sowerby Bridge.**—EXTENSION OF PURCHASE PERIOD.—The Electricity Commissioners have made an Order further extending by one year the period in which the Council may give notice to purchase the undertaking authorised by the Sowerby Bridge Electric Lighting Orders, 1900 and 1908.

**Stockton-on-Tees.**—ELECTRICAL SCHEMES IN PROSPECT.—Capital expenditure proposed to be incurred this year by the Corporation Electricity Department includes:—Substations in Norton Street (£10,855), Hallifield Street (£5,472), West Row (£13,004), Outram Street (£7,094) and Durham Road recreation ground (£6,888); supplies to Darlington Lane houses (£16,271) and Albany Road houses (£8,140) and miscellaneous services (£10,000). Provision of

electricity to the Preston Hill Estate will cost £3,416 including £1,123 for the substation and £500 for the transformer.

**Stoke Newington.**—CHARGES AND HIRE ARRANGEMENTS.—On the recommendation of the Charges Sub-Committee the Electricity Committee has adjourned consideration of the question of reintroducing the assisted wiring scheme. It is proposed to resume the hire-purchase scheme as and when the necessary equipment becomes available. Tenders are to be obtained for apparatus, including refrigerators, in order that it may be hired by consumers. The Committee has also decided to introduce a commercial two-part tariff. No alterations are to be made in the present electricity charges.

**Stratford-on-Avon.**—OBJECTION TO OVERHEAD LINES.—A local inquiry was held last week on behalf of the Ministry of Fuel and Power by Mr. D. A. Erskine, appointed by the Electricity Commissioners, regarding a proposal to erect overhead lines to seven farms and twenty farm cottages on the edge of the borough. For the Shropshire, Worcestershire and Staffordshire Electric Power Co. Mr. Andrew Precope said that of the proposed line of 6,000 yd., less than half was within the borough, and the cost for this section would be approximately £1,600, compared with £4,539 for an underground cable.

Mr. Rowland Randall, divisional manager of the company, said that any increase in costs would have to be passed on to the farmers and might prevent them taking electricity, with obvious loss to the country's food production.

Mr. D. K. Brown, for the Town Council, said that Stratford-on-Avon was a unique town, with historic and cultural associations known all over the world, and those matters were not to be regarded from a purely utilitarian point of view. The S. W. & S. Company was a large concern with tremendous responsibilities and resources, and it would be no hardship for it to put that small section of line underground.

The inquiry closed and the inspector visited the sites.

**Walthamstow.**—HIGHER CHARGES.—By a decision of the Electricity Committee the war increase in charges, which was reduced from 15 to 10 per cent. in January, 1943, is to be raised again to 15 per cent.

**Watford.**—P.F. CORRECTION FOR FLUORESCENT LIGHTING.—The general manager of the Electricity Department has suggested to the Electricity Committee that new users of fluorescent lighting should be required to install a p.f. correction device maintaining a power factor of 0·85.

HIRE-PURCHASE.—Hire-purchase facilities are to be re-introduced when justified by the delivery of apparatus.

ELECTRIC COOKERS.—The Hemel Hempstead Housing Committee has made arrangements for the Watford Corporation Electricity Department to provide electric cookers on the housing estate.

**Woking.**—PURCHASE DATE POSTPONED.—A further extension of two years of the period within which the Woking and Chertsey Urban District Councils may purchase the part of the Woking Electric Supply Company's undertaking authorised by its Order of 1900 has been made by the Electricity Commissioners.

## Development in Northern Ireland

A CONTINUOUS and extending interest in the use of electricity on the farm is recorded in the thirteenth annual report of the Electricity Board for Northern Ireland, which covers the calendar year 1944. This the report attributes in part to the successful results obtained by farmers already taking supplies. On some of the bigger farms between 30,000 and 40,000 kWh is being used annually at a net average price of between 0·8d. and 0·9d. per kWh. The Board is carrying out a detailed survey of certain farming districts in order to obtain the fullest possible data for determining the most suitable type of development to cope with particular requirements.

During the year the Board sold 100·3 million kWh to 45,999 consumers, compared with 88 million kWh to 45,142 consumers in the previous year, and the average selling price—1·38d.—was the lowest in the Board's history, comparing with 1·44d. in 1943. Two concessions were made during the period under review; the 10 per cent. war addition imposed in 1940 was halved and the annual revenue guarantee for mains extensions was reduced from 20 to 12½ per cent. A Development Scheme (No. 8) was introduced in respect of certain parts of Antrim and Londonderry.

The total number of kWh generated at the Ballylumford station (operated by the Board on behalf of the Ministry of Commerce) was 87 million, the station being run in parallel with Belfast Corporation's Harbour power station.

Revenue during 1944 amounted to £617,460 (against £572,780 in 1943) and working expenses were £399,427 (£343,059). After meeting all charges there was a surplus of £1,945 making, with £32,730 brought forward, a credit balance of £34,675. At the end of the year the Board had exercised borrowing powers up to £2,450,000 (excluding loans of £160,143 in respect of local authority undertakings acquired) and of this amount £1,907,534 was outstanding.

The report is signed by Mr. Lendrick McMaster, secretary to the Board.

## INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

" A.C.S." float switch.

" Electracraft " fire.

# Complexor Representation of Electric Power

By D. W. C. Shen, B.Sc.*

SOME electrical engineers feel that the development of the complexor theory of alternating currents is not logical, especially when applied to electric power. Strictly speaking, alternating current theory as taught to students to-day is based on complex scalars or complexors instead of on vectors.

The vector theory of alternating currents was first introduced by Dr. A. P. T. Sah, Massachusetts Institute of Technology (to whom the present writer is indebted) in the solution of unbalanced three-phase systems. Thus vector current and vector voltage, such as $\mathbf{I} = I_i\,\mathbf{i} + I_j\,\mathbf{j} + I_k\,\mathbf{k}$ and $\mathbf{E} = E_i\,\mathbf{i} + E_j\,\mathbf{j} + E_k\,\mathbf{k}$ are real space vectors with the three components designating the three different phase values. The relation between E and I is an entity known as a dyadic impedance or admittance, such as $\mathbf{E} = \mathbf{Z}\cdot\mathbf{I}$ or $\mathbf{I} = \mathbf{Y}\cdot\mathbf{E}$, where Z and Y when written in nonion forms with their base vectors omitted are

$$\begin{bmatrix} Z_{ii} & Z_{ij} & Z_{ik} \\ Z_{ji} & Z_{jj} & Z_{jk} \\ Z_{ki} & Z_{kj} & Z_{kk} \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} Y_{ii} & Y_{ij} & Y_{ik} \\ Y_{ji} & Y_{jj} & Y_{jk} \\ Y_{ki} & Y_{kj} & Y_{kk} \end{bmatrix}$$

respectively. When steady sinusoidal waves are considered, the vector currents and voltages are generalised to complex space vectors, and the dyadic impedances or admittances become complex dyadics. In view of the publication of Sah's classic papers in the *Transactions* of the A.I.E.E. in 1936, the complex theory of single-phase AC circuits should not be confused with vectors but none of the existing textbooks or papers dealing with this subject has made this point clear. It is the purpose of this article to show that the single-phase AC theory of electric power based on complexors can be logically expounded once the correlation between complexor representation and the instantaneous value is well established.

In a recent paper on the "Vector of Electric Power" it was stated: "Let i and e be the instantaneous values of current and voltage. Then $i = I_{max} \sin(\psi + \omega t)$ and $e = E_{max} \sin(\theta + \omega t)$, while the instantaneous value of the power is: $I_{max} E_{max} \sin(\psi + \omega t) \sin(\theta + \omega t)$. It is easy to show that this equals $IE[\cos\phi - \cos(\psi + \theta + 2\omega t)]$, where I and E are RMS values and $\phi = \theta - \psi$. The second part of this expression varies with time and has an average value of zero. It proves that the volt-amperes alternate with twice the system frequency. This is identical with the real component of the product $IE = Ie^{j(\psi + \omega t)}\, Ee^{j(\theta + \omega t)} = IEe^{j(\psi + \theta + 2\omega t)}$. We are not often concerned with this part. What usually interests more is the other part: $IE\cos\phi$. It does not vary with time but retains the same value from moment to moment. It stands for the average power in the system and is the real component of the non-variable complex quantity $IEe^{j\phi}$. Knowing that this is the result we seek, we can manipulate the 'vectors' of current and voltage until we get it."

The author of the above, like many others, seems to have overlooked the fact that the part which interests us more, *i.e.*, $IE\cos\phi$, does vary with time and is a function of double frequency.

### Power in R, L, C Series Circuit

Let us consider the R, L, C series circuit. Assume $i = \sqrt{2}\, I \cos(\omega t + \beta)$ $e = \sqrt{2}\, E \cos(\omega t + \alpha)$, $\theta = \alpha - \beta$, the resistance of the circuit is R, its inductive reactance is $X_L = \omega L$, its capacitive reactance is $X_C = \dfrac{1}{\omega C}$ and its effective reactance is $X = \omega L - \dfrac{1}{\omega C}$. The instantaneous power absorbed by the circuit is $p = ei = 2\,EI\cos(\omega t + \alpha)\cos(\omega t + \beta) = EI[\cos(\alpha - \beta) + \cos(2\omega t + \alpha + \beta)] = ZI^2[\cos\theta + \cos(2\omega t + \alpha + \beta)] = RI^2 + ZI^2\cos(2\omega t + \alpha + \beta)$ .....(1)

The first term is the average value of the power in a cycle and is the power consumed by the resistance. The second term represents a sinusoidal wave of double frequency, its amplitude might be explained as the product of the effective value of current I and the effective E across the impedance Z. If we note that $\alpha = (\beta + \theta)$ and resolve the second term again, we obtain: $ZI^2\cos(2\omega t + \alpha + \beta) = ZI^2\cos[2(\omega t + \beta) + \theta] = ZI^2[\cos\theta\cos 2(\omega t + \beta) - \sin\theta\sin 2(\omega t + \beta)] = RI^2\cos 2(\omega t + \beta) - XI^2\sin 2(\omega t + \beta) = RI^2\cos 2(\omega t + \beta) + XI^2\cos\{2(\omega t + \beta) + 90°\}$

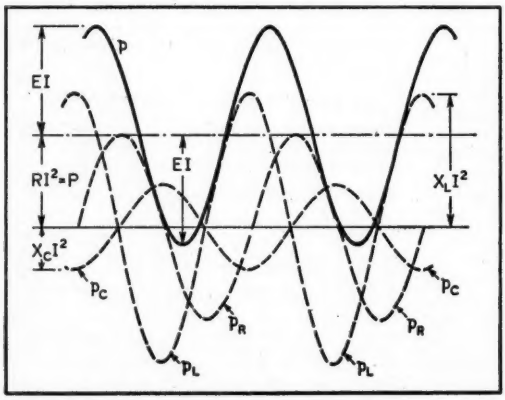
* A note on Mr. Shen's career appears in our "Personal and Social" section.

$= [EI \cos\theta] \cos 2(\omega t + \beta) + [EI \sin\theta] \cos 2\{(\omega t + \beta) + 90°\}$ .....(2)

Thus we see that under ordinary conditions, the sinusoidal part of the power in an AC circuit can again be resolved into two terms: one with amplitude $RI^2 = EI \cos\theta$ which equals the active power consumed by the resistance, the other with amplitude $XI^2 = EI \sin\theta$ which equals the power absorbed and returned to the source by the effective reactance (inductive is positive, capacitive negative). Since $X = X_L - X_C = \omega L - \frac{1}{\omega C}$, therefore the instantaneous value of the second term power may be expressed as: $XI^2 \cos\{2(\omega t + \beta) + 90°\} = \omega LI^2 \cos\{2(\omega t + \beta) + 90°\} - \frac{1}{\omega C} I^2 \cos\{2(\omega t + \beta + 90°\}$

$= \omega LI^2 \cos\{2(\omega t + \beta) + 90°\} + \frac{1}{\omega C} I^2 \cos\{2(\omega t + \beta) - 90°\}$ .....(3)

This shows that if the current phase angle is taken as reference, the inductive power leads the sinusoidal part of the power in the resistance by 90 deg., whereas the capacitive power lags by 90 deg. This is equivalent to




the fact that the voltage drop across inductance leads current by 90 deg., while the voltage drop across capacity lags current by 90 deg.

The accompanying diagram illustrates the component powers: $p = RI^2 + p_R + p_L + p_C$, $p_R = RI^2 \cos 2(\omega t + \beta) = EI \cos\theta \cos 2(\omega t + \beta)$, $p_L = \omega LI^2 \cos\{2(\omega t + \beta) + 90°\}$ and $p_C = \frac{1}{\omega C} I^2 \cos\{2(\omega t + \beta) - 90°\}$.

The sign of the reactive power is not arbitrary. If inductive power is considered as positive, then capacitive power must be considered as negative and vice versa. It has been explained in the above paragraph that with current as reference, inductive power leads the sinusoidal part of the power by 90 deg., and the capacitive power lags by 90 deg. This seems to say that the adoption of inductive power as positive is reasonable. But if voltage is taken as reference, *i.e.*, eliminating $\beta$ from equation (1) and keeping $\alpha$ and $\theta$, $\theta = \alpha - \beta$, the sinusoidal part of equation (1) becomes: $ZI^2 \cos(2\omega t + \alpha + \beta) = ZI^2 \cos[2(\omega t + \alpha) - \theta] = ZI^2[\cos\theta \cos 2(\omega t + \alpha) + \sin\theta \sin 2(\omega t + \alpha)] = RI^2 \cos 2(\omega t + \alpha) + XI^2 \sin 2(\omega t + \alpha) = RI^2 \cos 2(\omega t + \alpha) + XI^2 \cos\{2(\omega t + \alpha) - 90°\} = RI^2 \cos 2(\omega t + \alpha) + X_L I^2 \cos\{2(\omega t + \alpha) - 90°\} - X_C I^2 \cos\{2(\omega t + \alpha) - 90°\} = RI^2 \cos 2(\omega t + \alpha) + \omega LI^2 \cos\{2(\omega t + \alpha) - 90°\} + \frac{I^2}{\omega C} \cos\{2(\omega t + \alpha) + 90°\}$ .....(4)

Evidently when voltage is taken as reference, the second term inductive power lags by 90 deg. and the third term capacitive power leads by 90 deg. In other words, when we consider capacitive power as positive and inductive power as negative, we mean that we have adopted voltage as reference. The committee on Electromagnet Units of the International Electrotechnical Commission in 1934 adopted the convention that capacitive power should be positive, *i.e.*, the reactive power of leading current should be positive.

It is convenient from a theoretical point of view to be able to represent power by a complexor, thus putting it on par with sinusoidal voltage and current and circuit constants like R, L, C. Once this is done, the calculations of single-phase AC circuits involve only the manipulations of complex scalars. It might be expected that the complex representation of power would be $\dot{E}\dot{I}$, the absolute value would represent apparent power, the real part active power and the imaginary part reactive power. Unfortunately this is not true, because the sinusoidal part of the AC power is a function of double frequency.

When we use complexors to represent sinusoidal voltages and currents, we have established the correlations between complexors and instantaneous values as follows:

$\dot{E} \sim \text{Re}\,(\dot{E})\, e^{j\omega t}$, $\dot{I} \sim \text{Re}\,(\dot{I})\, e^{j\omega t}$ .....(5)

where the symbol Re denotes taking the real part of the operand. Accordingly, one may obtain $\dot{E}\dot{I} \sim \text{Re}\,(\dot{E}\dot{I})\, e^{j\omega t}$.....(6)

which represents a sinusoidal wave of the same frequency as E and I and no physical phenomenon has so far been found to be associated with it. Though a new correlation must be established before we can represent power by complexor, it will not be difficult if the correlation is to be based on equation (4). Let $\alpha = 0$ (*i.e.*, take voltage as reference) and rewrite equation (4) as follows: $RI^2 \cos 2\omega t + X_L I^2 \cos(2\omega t - 90°) + X_C I^2 \cos(2\omega t + 90°) = \text{Re}\,[RI^2 e^{j2\omega t} + X_L I^2 e^{j\left(2\omega t - \frac{\pi}{2}\right)} + X_C I^2 e^{j\left(2\omega t + \frac{\pi}{2}\right)}] = \text{Re}\,[(RI^2 - jX_L I^2 + jX_C I^2)\, e^{2j\omega t}]$ .....(7)

The complexor in the bracket is all-embracing, it tells us everything about power: the real part RI represents active power, the imaginary part represents reactive power (the convention of sign adopted above is automatically taken care of), and its absolute value $\sqrt{(RI^2) + (XI^2)} = I^2\sqrt{R^2 + X^2} = ZI^2 = EI$.....(8)

is the apparent power of the electric circuit. Therefore, the complex power should be: $\dot{W} = p + jQ = RI^2 + j(X_C - X_L) I^2 = (R - jX) I^2 = (R - jX)\, \dot{I}^* \dot{I} = (R + jX)^* \dot{I}^* \dot{I} = \dot{Z}^* \dot{I}^* \dot{I} = \dot{E}^* \dot{I}$....(9)

or the correlation between complex power and the sinusoidal part of power is:

$\dot{W} = \dot{E}^* \dot{I} \sim \text{Re}\,(\dot{E}^* \dot{I})\, e^{2j\omega t}$ .....(10)

If we take $\alpha$ as O, then the instantaneous power will be: $p = RI^2 + \text{Re}\,(\dot{E}^* \dot{I})\, e^{2j\omega t} = P + \text{Re}\,(\dot{E}^* \dot{I})\, e^{2j\omega t} = \text{Re}\,\dot{E}^* \dot{I}(1 + e^{2j\omega t})$.(11a)

its general form will be: (when $\alpha \neq 0$)

$p = \text{Re}\,\dot{E}^* \dot{I}\,(1 + e^{2j(\omega t + \alpha)})$.....(11b)

In other words, the complex power absorbed by an electric circuit is equal to the product of the conjugate of $\dot{E}$, that is $\dot{E}^*$, by its complex current $\dot{I}$, which is obviously different from the product $\dot{E}\dot{I}$.

# Forthcoming Events

**Saturday, February 2nd.**—*Manchester.*—Engineers' Club, Albert Square, 2.30 p.m. I.E.E. North Western Students' Section. "The Measurement and Reduction of Noise," by Dr. A. J. King.

*Farnborough.*—Grange Hostel, Hawley Lane, 3 p.m. I.E.E. Hampshire Sub-Centre. "The Design and Use of Radio-Frequency Open-Wire Transmission Lines and Switchgear for Broadcast Systems," by F. C. McLean and F. D. Bolt.

**Monday, February 4th.**—*Sheffield.*—The University, Western Bank, 6 p.m. Illuminating Engineering Society, Sheffield Centre (North Midland Area). "Short Cuts in Illuminating Engineering," by W. J. G. Davey.

*Birmingham.*—James Watt Institute, 6 p.m. I.E.E. South Midland Centre. "Some Notes on Transformer Practice with reference to Standardisation," by A. G. Ellis.

**Tuesday, February 5th to Friday, February 8th.**—*London.*—Lighting Service Bureau, 2, Savoy Hill. Daily from 9.30 a.m. (luncheon interval, 12.30 p.m.). Illumination Design Course.

**Tuesday, February 5th.**—*Luton.*—Town Hall, 7.30 p.m. Luton Electrical Society. Informal meeting. "The Application and Care of Industrial Electrical Instruments," by W. G. Tildesley.

**Wednesday, February 6th.**—*Coventry.*—St. Mary's Hall, 6 p.m. Coventry Electric Club. "Electrical Research," by H. Warren.

**Thursday, February 7th.**—*London.*—Institution of Electrical Engineers, 5.30 p.m. "Fundamental Legislation for Electricity Supply to Consumers," by W. Fennell.

**Friday, February 8th.**—*London.*—St. Stephen's Tavern, Bridge Street, Westminster, 6.30 p.m. Electrical Power Engineers' Association. "Interesting Bulk Supply Metering Equipment," by L. W. Burcham.

Institution of Electrical Engineers, 11.30 a.m. British Electrical & Allied Industries Research Association. Annual meeting. Connaught Rooms, W.C.2. 12.45 for 1 p.m. Luncheon and presidential address by Sir Charles Darwin.

**Saturday, February 9th.**—*Leeds.*—Association of Mining Electrical and Mechanical Engineers (Yorkshire North West Branch). "Commutator Variable Speed Motors," by W. Acton.

**Monday, February 11th.**—*Wolverhampton.*—Electricity Sports and Social Club, St. Mark's Road, 6.45 p.m. E.P.E.A. (Midland Technical Group). "Integrating Meters—Accuracy Levels," by M. Whitehead.

*London.*—Royal Society of Arts, John Adam Street, Adelphi, 5.30 p.m. Institution of Electronics. "Glass for Electron Tubes," by Dr. J. H. Partridge.

*Nottingham.*—Corporation Gas Showrooms. Nottingham Society of Engineers. Discussion on the "Severn Barrage Report."

*Newcastle-on-Tyne.*—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Some Notes on Transformer Practice with reference to Standardisation," by A. G. Ellis.

## Post-advanced Lectures

The Regional Advisory Council for Technical and Other Forms of Further Education for Manchester and District, Education Offices, Deansgate, Manchester, 3, has published a booklet giving details of post-advanced lectures in electrical and mechanical engineering for the 1945-46 session.

# FINANCIAL SECTION

## Company News. Stock Exchange Activities.

## Reports and Dividends

**The Decca Record Co., Ltd.,** proposes to make an issue of new share capital of the nominal amount of £600,000. The additional capital is required for the re-equipment and extension of the record factory, the development of the Decca Navigator, and the redemption of the outstanding £215,470 6½ per cent. debenture stock. Resolutions providing for the consolidation and conversion of 12,000,000 unissued ordinary shares into 600,000 5 per cent. cumulative preference shares of £1 each, an alteration in the rights of existing 10 per cent. participating preference shares, and a conversion offer to debenture holders are to be considered at meetings on February 12th. Debenture stock not converted will be redeemed on August 28th and the new preference shares not required for conversion are to be issued to Securities Agency, Ltd., at 20s. 7½d. per share.

**The Engineering & Lighting Equipment Co., Ltd.,** is holding meetings on February 19th to consider the alteration of the preference share redemption provisions by which repayment is to be made by March, 1954. It is stated that under the present arrangements the ordinary dividend, which was 8 per cent. last year, is not likely to exceed 5 per cent. and it is considered that holders of the preference shares would prefer to have the life of their shares extended on the present 7 per cent. basis. The proposals are to cancel the fixed annual redemption contribution and thus make more available for ordinary dividend. Redemption contributions would be recommended each year. If the proposals are accepted it is expected that an interim dividend of 3 per cent. will be paid immediately.

**Tecalemit, Ltd.,** reports a profit of £111,249 (against £97,958) for the year ended July 31st last. The dividend is maintained at 12 per cent. by a final payment of 6 per cent.

**Mexico Tramways Co.**—Asked to prepare within thirty days its defence to a five-point communication demanding the cancellation of its concessions the company has issued a statement in which it charges the Mexican Government with attempting to confiscate the company's property under an unconstitutional decree without compensating the shareholders. The company says that false propaganda has made the workers believe that it does not wish to maintain or improve its properties or pay adequate wages.

**The India Rubber, Gutta Percha & Telegraph Works Co., Ltd.,** is paying the fixed dividend of 6 per cent. on the ordinary shares and an additional 3 per cent. for last year (same) from a net profit of £107,861 (£105,474).

**The Electrical & Industrial Investment Co., Ltd.,** is again paying a dividend of 12 per cent. on the deferred shares from a net profit of £22,111 for 1945 (against £21,881 for 1944.

**The Anglo-American Telegraph Co., Ltd.,** is paying a final dividend of 1½ per cent., again making 3¾ per cent. for the year.

## New Companies

**Bedke, Ltd.**—Private company. Registered January 22nd. Capital, £1,000. Objects : To carry on the business of manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, transformers and electrical plant, etc. Directors: S. J. Bedford, 60, Bramerton Road, Beckenham, Kent; H. H. Keal, A.M.I.Mech.E., 5, Oakfield Gardens, Beckenham; and D. A. Keal, 5, Oakfield Gardens, Beckenham. Registered office: The Factory, Moiety Road, West Ferry Road, Millwall, E.14.

**R. Bartlett (Electricals), Ltd.**—Private company. Registered January 14th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, and dealers in, dynamos, motors, armatures, magnetos, batteries, conductors, transformers, stoves, cookers, rubber insulating materials and general electrical plant, accessories and supplies of all kinds, etc. Directors: R. Bartlett, W. W. Avent and Doris M. Bartlett, all of 2, Westerham Avenue, Edmonton, N.9. Registered office: 2, Westerham Avenue, Edmonton, N.9.

**Aeta Electric Co., Ltd.**—Private company. Registered January 17th. Capital, £2,000. Objects : To carry on the business of electricians, electrical and mechanical engineers, etc. Directors: L. J. Thomas, 34, Crown Hill Road, Woodford Bridge, and K. Thomas, 67, Fortis Green, East Finchley, N.2. Registered office: Albion House, 87/9, Aldgate High Street, E.C.3.

**H. H. Hywood, Ltd.**—Private company. Registered January 21st. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, manufacturers of, and dealers in, machinery and electrical goods, etc. H. H. Hywood, 40, Coram Street, W.C.1, is the first director. Secretary: Lawrence J. Duggan.

**Southall, Tutton & Son, Ltd.**—Private company. Registered January 18th. Capital, £1,000. Objects: To carry on the business of electrical, mechanical, motor and general engineers and contractors, proprietors of battery service and charging stations, wireless service agents, etc. Directors: W. A. Tutton, Buttington, New Hall, Welshpool, Montgomery, and two others. Registered office: 23, Severn Street, Welshpool.

**J. B. Mulvenna & Co., Ltd.**—Private company. Registered in Belfast January 11th. Capital, £1,000. Objects: To acquire the business of John B. Mulvenna, electrical engineer and contractor, etc. Directors: J. B. Mulvenna, 529, Falls Road, Belfast, and J. P. Mulvenna, 40, St. Meryl Park, Belfast. Registered office: 19, Chichester Street, Belfast.

**Isopad, Ltd.**—Private company. Registered January 16th. Capital, £500. Objects: To carry on the business of manufacturers of electro-medical appliances, electrical heating pads and blankets and medical, surgical and

scientific appliances of all kinds, manufacturers of, and dealers in, electric accumulators, batteries, etc. Subscribers: W. Rich, 65, Lancaster Close, St. Petersburgh Place, W.2., and R. Moller, 149, Ralph Court, W.2.

**Wells Pridgeon Electrics, Ltd.**—Private company. Registered January 16th. Capital, £1,000. Objects: To carry on the business of radio, electronic and electro-acoustics engineers, electrical installation contractors, etc. Directors: W. E. Wells, 52, London Road, Brighton, and A. Pridgeon, 31, Drayton Road, Portsmouth. Registered office: 2a, Seagrove Road, North End, Portsmouth.

**Haru Electrical Fittings, Ltd.**—Private company. Registered January 22nd. Capital, £100. Objects: To carry on the business of manufacturers and factors of electrical, mechanical, radio and television fittings and apparatus, etc. Subscribers: V. Harris, 33, D'Arblay Street, W.1, and E. Lasky, 100, Corringway, Ealing, W.5. Registered office: 244/6, Abbey House, Victoria Street, S.W.1.

**Radiant Cavity Signs, Ltd.**—Private company. Registered January 12th. Capital, £10,000. Objects: To carry on the business of illuminated sign manufacturers, electrical engineers, constructors, fitters and installers of signals, indicators and advertising devices, etc. Directors: C. Beck, 25, Navarino Road, Worthing, and E. Bailey, 2, Montpelier Crescent, Brighton. Registered office: 24, Eastcheap, E.C.3.

**Northern Heat, Light & Power Supplies, Ltd.**—Private company. Registered January 16th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, heating, lighting and power apparatus, etc. Directors: E. G. Clark and J. C. Lockerbie, both of Ford Bank, Wetherby, Yorks.

**James Arthur Graham, Ltd.**—Private company. Registered in Edinburgh January 12th. Capital, £500. Objects: To carry on the business of electricians and wholesalers and manufacturers of, and dealers in, television apparatus, etc. Directors: J. A. Graham, 26, East Argyle Street, Helensburgh, and R. E. Harthopf, 4, Campbell Street, Helensburgh. Registered office: Inn Court, Rhu, Dumbartonshire.

**Strutt Radio, Ltd.**—Private company. Registered January 16th. Capital £1,000. Objects: To acquire the business previously carried on as "C. W. Strutt" as a radio engineer, electrical dealer, etc. Directors: Margaret G. Strutt, 8, Elm Grove, Erith, Kent, and M. R. Etheridge, 41, Aperfield Road, Erith. Registered office: 90, High Street, Erith, Kent.

**Fisher Sales & Export, Ltd.**—Private company. Registered January 11th. Capital, £250. Objects: To carry on the business of manufacturers of, and dealers in, electrical goods and components, wireless and television sets and parts, electrical work for sea and aircraft, etc. Directors: F. J. Fisher (permanent director and chairman) and Mrs. Grace J. Fisher, both of 37, The Heights, Northolt Park, Greenford.

**Cooper, Irwin & Co., Ltd.**—Private company. Registered January 9th. Capital, £1,500. Objects: To carry on the business of manufacturers, assemblers, installers, repairers, etc., of radio receiving and transmitting apparatus; electrical and radio engineers, etc. Permanent directors: F. D. R. Fluellen, address not stated, G. B. Beecham, 299, West Green Road, Tottenham, N.15, and two others. Registered office: 93, The Drive, North Harrow, Mdx.

**L. M. Boys, Ltd.**—Private company. Registered January 3rd. Capital, £450. Objects: To carry on the business of manufacturers of, agents for, and dealers in, lamp shades, globes, bulbs and electrical and radio fittings, apparatus and accessories, etc. Directors: J. C. Boys and Lily M. Boys, both of 5, Little Heath, Charlton, S.E.7. Registered office: 5, Little Heath, Charlton, S.E.7.

**Epstein & Marco, Ltd.**—Private company. Registered in Edinburgh January 11th. Capital, £100. Objects: To carry on the business of manufacturers of, agents for and dealers in, electrical accessories, wireless goods, etc. Directors: Jane Epstein, 15, Nithsdale Road, Glasgow, S.1, and B. Marco, 651, Shields Road, Glasgow, S.1. Registered office: 28, St. Enoch Square, Glasgow.

## Mortgages and Charges

**Altass Electric Co., Ltd.**—Mortgage on 82, Plough Road, Battersea, dated December 20th, 1945, to secure £450 and further advances. Holders: Halifax Building Society.

**Ranelagh Radio & Electrical Co., Ltd.**—Issue on January 3rd, 1946, of £200 debentures, part of a series already issued, making, with the amount already issued, £300.

**Burdette & Co., Ltd.**—Charge on leasehold land and buildings in Stonehouse Street, Wandsworth, S.W., dated December 18th, 1945, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

**Davey, Paxman & Co., Ltd.**—Mortgage on properties in Colchester, dated December 31st, 1945, to secure £460. Holders: Colchester Permanent Benefit Building Society.

## Winding-up Petition

**Barlite Lamps, Ltd.**—A petition for the winding-up of this company has been presented to the Chancery Division by the Modern Telephone Co., Ltd., and will be heard on February 4th. Copies of the petition can be obtained from Mr. G. A. Elkin, 1, Chesterfield Street, W.1. Notification of intention to appear at the hearing must be sent to Mr. Elkin by February 2nd.

## Bankruptcies

**M. Skulnick,** battery manufacturer, 83, Wellesley Court, Maida Vale.—At a sitting of the London Bankruptcy Court held recently before Mr. Registrar Parton the public examination was held and concluded. The statement of affairs showed one liability of £219 and no realisable assets. Debtor stated that he commenced business in 1938 and attributed his failure to extravagance in living, but immediately to costs of a legal action which was decided against him.

**R. H. Levy,** 29, Roman Road, Linthorpe, Middlesbrough, electrician.—Last day for receiving proofs for dividend, February 14th. Trustee, Mr. C. G. Sparrow, 14, Bridge Street, Stockton-on-Tees.

# STOCKS AND SHARES

STOCK Exchange markets have certainly started the year well. The first month has produced a surprisingly large volume of business, the greater part of which is on the buying side, with the result that prices, where they move, generally go better. Weight of money and the Government's continued policy of lowering rates of interest, are the main causes of the strength shown by British Government and other gilt-edged securities. For some time past debenture stocks have been extremely difficult to buy; nine times out of ten the would-be purchaser is told that there is none on offer.

**The Rising Tide**

A similar state of affairs is beginning to obtain in various well-protected preference shares, while the ordinary groups are the subject of constant search for investments that will pay 4 to 4½ per cent. on the money. Nor are these by any means easy to obtain. Were it not for deceased accounts, Stock Exchange markets would be in the singular position of having little to offer except, of course, in the speculative issues. Our comparative tables show, since the end of December when the last lists were made up, a long catalogue of rises. Previous falls are now almost regained and the disposition in most parts of the Stock Exchange is towards still higher prices.

**Dividend Estimates**

As the time approaches for declaration of dividends on the ordinary shares of Home electricity companies, estimates begin to attempt a forecast of what the companies are likely to distribute in respect of 1945. The suggestion has already been put forward that they might revert to pre-war dividends, which in various cases were higher than those of the war period. For instance, County of London ordinary received 10½ per cent., against the annual 8 per cent. paid during the war.

In the Stock Exchange market, however, the opinion is voiced that, under present political conditions, the raising of dividends would be anything but judicious. It is thought that directors will be more likely to act cautiously than to increase previous payments. No little interest attaches to what will happen, and in the meantime the market for the ordinary shares remains firm, with a rising tendency. Advances ranging from 6d. to a florin have occurred in all the groups, London, Scottish and provincial.

**Stock on Offer**

Prices at which fixed-interest stocks are on offer in the electrical markets continue to reflect a certain chariness, on the part of investment, to pay much over par for the preference shares of the supply companies. The return of £3 16s. per cent. on Scottish Power 4 per cent. preference, offered at 21s. ex dividend, compares with a round 5 per cent. yield on City of London "eights" at 32s. Between these extremes, the 6 per cent. preferences of British Power and Light or Electrical Distribution of Yorkshire can be bought to pay a shade over 4½ per cent. on the money.

**American Labour Troubles**

The United States usually does things on the grand scale, and the strike amongst telephone and telephone staffs, spreading later until it included many other branches of industry, was certainly spectacular. It caused a general fall of prices in Wall Street, but the only repercussion on this side was a comparatively trifling reaction, subsequently recovered, in Brazilian Traction shares. International Telephone & Telegraph gave way. For so portentous an event as this strike, the market effect over here was small. It would have been considerably greater were it not for the fact that, as regards the majority of American stocks and shares, holders on this side can sell, but not buy them, which makes the market, of course, extremely limited. Prices are controlled entirely from America.

**E. K. Cole Dividend**

E. K. Cole 5s. shares reacted with a drop of 1s. 9d. to 33s. 9d., to the dividend announcement and preliminary figures for the year to September, 1945. Net profits, at just under £100,000 are £40,000 down on the previous year's, but the dividend is again brought up to 20 per cent. Evidently the distribution remains comfortably covered by the profits available, although less so, of course, than last year's, when earnings represented 120 per cent. on the £202,000 of ordinary capital. In front of the ordinary is £250,000 in 5½ per cent. first preference capital and £184,000 in 7 per cent. participating preferred ordinary shares. The latter are entitled to participate up to a further 3 per cent., after 7 per cent. has been paid on the ordinary. The preferred ordinary stand at about 40s. to yield 5 per cent. On the ordinary, the yield works out at a shade under 3 per cent.

**Radio and Television**

Interest in radio shares generally continues active. The E. K. Cole chairman's review will be followed by the market for light on reconversion problems, as these are affecting the radio and electrical manufacturers, and on the potentialities of the scientific developments of war time as applied in peacetime markets.

A recent feature of the industrial markets has been an outbreak of optimistic interest in the 5s. shares of Scophony, the television company. From 8s. 9d., the price jumped in one day to 13s. 6d. Later it rose to 14s. 9d. Much of the buying is reported to originate from America. A. C. Cossor shares, after being down to 44s., rallied abruptly to 45s. 6d. on the remarkable developments reported in connection with radar. Philco shares threw

(*Continued on page* 190)

# ELECTRICAL INVESTMENTS

## Past Month's Price Changes

| Company | Dividend Previous | Dividend Last | Middle Price Jan. 25 | Month's Rise or Fall | Yield p.c. £ s. d. |
|---|---|---|---|---|---|
| **Home Electricity Ordinary** | | | | | |
| Bournemouth and Poole | 12½ | 12½ | 60/– | +1/– | 4 3 4 |
| British Power and Light | 7 | 7 | 27/6 | +6d. | 5 1 10 |
| City of London | 5½ | 6 | 27/6 | .. | 4 7 3 |
| Clyde Valley | 8 | 8 | 42/– | +2/6 | 3 16 2 |
| County of London | 8 | 8 | 42/– | +4/– | 3 16 2 |
| Edmundsons | 6 | 6 | 26/6 | +6d. | 4 10 7 |
| Elec.Dis.Yorkshire | 9 | 9 | 40/– | .. | 4 10 0 |
| Elec. Fin. and Securities | 12½ | 13½ | 55/3 | +1/– | 4 17 10 |
| Elec. Supply Corporation | 10 | 10 | 44/– | −1/– | 4 11 0 |
| Lancs. Light and Power | 7½ | 7½ | 32/6 | .. | 4 12 4 |
| Llanelly Elec. | 6 | 6 | 25/6 | .. | 4 14 0 |
| Lond.Assoc.Electric | 3 | 4 | 26/6 | +6d. | 3 0 6 |
| London Electric | 6 | 6 | 27/– | .. | 4 9 0 |
| Metropolitan E.S. | 8 | 8 | 42/– | +1/6 | 3 16 0 |
| Midland Counties | 8 | 8 | 38/– | +6d. | 4 4 4 |
| Mid. Elec. Power | 9 | 9 | 41/6 | +1/– | 4 7 0 |
| Newcastle Elec. | 7 | 7 | 29/3 | .. | 4 15 9 |
| NorthEasternElec. | 7 | 7 | 32/– | +6d. | 4 7 6 |
| Northampton | 10 | 10 | 47/– | +6d. | 4 5 0 |
| Northmet Power | 7 | 7 | 38/– | +6d. | 3 13 3 |
| Richmond Elec. | 6 | 6 | 27/– | .. | 4 9 0 |
| Scottish Power | 8 | 8 | 35/6 | +6d. | 4 10 2 |
| Southern Areas | 5 | 5 | 23/– | .. | 4 7 0 |
| South London | 7 | 7 | 29/– | .. | 4 16 7 |
| West Devon | 5 | 5 | 25/6 | +6d. | 3 18 5 |
| West Glos. | 4½ | 3½ | 26/– | +6d. | 2 14 0 |
| Yorkshire Elec. | 8 | 8 | 42/– | +2/6 | 3 16 0 |
| **Public Boards** | | | | | |
| Central Electricity: | | | | | |
| 1955–75 | 5 | 5 | 114 | .. | 4 7 9 |
| 1951–73 | 4½ | 4½ | 105 | .. | 4 5 9 |
| 1963–93 | 3½ | 3½ | 104 | .. | 3 7 4 |
| 1974–94 | 3½ | 3½ | 102 | .. | 3 3 9 |
| LondonElec.Trans. | 2½ | 2½ | 97½ | −½ | 2 11 4 |
| London & Home Counties 1955–75 | 4½ | 4½ | 111½ | −1 | 4 1 0 |
| Lond.Pass.Trans.Bd. | | | | | |
| A | 4½ | 4½ | 123½ | +3 | 3 13 0 |
| B | 5 | 5 | 117½ | −1 | 4 5 1 |
| C | 3½ | 3 | 63 | +3 | 4 15 3 |
| West Midlands J.E.A. 1948–68 | 5 | 5 | 105½ | .. | 4 14 9 |
| **Overseas Electricity Companies** | | | | | |
| Atlas Elec. | Nil | Nil | 10/– | +1/– | — |
| Calcutta Elec. | 6* | 6* | 59/– | −2/– | 2 9 8 |
| Cawnpore Elec. | 7 | 13 | 62/6 | +6d. | 4 3 4 |
| East African Power | 7 | 7 | 40/6 | .. | 3 9 6 |
| Jerusalem Elec. | 7 | 5 | 26/– | +6d. | 3 17 0 |
| Kalgoorlie (10/–) | 5 | 5 | 12/6 | .. | 4 0 0 |
| Madras Elec. | 4 | 6 | 40/6 | .. | 2 19 6 |
| Montreal Power | 1½ | 1½ | 27½ | +2 | — |
| Nigerian Elec. | 10 | 10 | 41/– | +1 | 4 17 7 |
| PalestineElec."A" | 5* | 5* | 37/6 | −1/6 | 2 13 4 |
| Perak Hydro-elec. | 6 | 7 | 16/6 | −6d. | — |
| Tokyo Elec. 6% | 6 | 6 | 55½ | +8 | — |
| VictoriaFallsPower | 15 | 15 | 5½ | +½ | 2 18 7 |
| Whitehall Inv. Pref. | — | 6 | 26/– | +1 | 4 12 4 |

| Company | Dividend Previous | Dividend Last | Middle Price Jan. 25 | Month's Rise or Fall | Yield p.c. £ s. d. |
|---|---|---|---|---|---|
| **Equipment and Manufacturing** | | | | | |
| Aron Elec. Ord. | 10 | 15 | 64/6 | .. | 4 13 1 |
| Assoc. Brit. Eng. | 6 | 7 | 51/3 | .. | 14 4 |
| Assoc. Elec.: | | | | | |
| Ord. | 10 | 10 | 57/6 | +2/– | 3 9 6 |
| Pref. | 8 | 8 | 39/9 | +1/– | 4 0 3 |
| AutomaticTel.&El. | 12½ | 12½ | 69/6 | +6d. | 3 12 0 |
| Babcock & Wilcox | 11 | 12 | 60/– | +2/3 | 4 0 0 |
| British Aluminium | 10 | — | 39/– | −6d. | — |
| British Insulated & Callender's | .. | .. | 46/6 | +2/– | — |
| British Thermostat (5/–) | 18½ | 18½ | 21/6 | .. | 4 6 1 |
| BritishVac.Cleaner (5/–) | 30 | 30 | 36/6 | +6d. | 4 2 2 |
| Brush Ord. (5/–) | 9 | 10 | 10/6 | .. | 4 15 4 |
| Burco (5/–) | 15 | 20 | 20/6 | +3d. | 4 17 9 |
| ChlorideEl.Storage | 15 | 15 | 87/6 | +½ | 3 8 6 |
| Chr ty Bros. | 12½ | 17½ | 80/– | .. | 4 7 6 |
| Cole, E. K. (5/–) | 20 | 20 | 33/9 | −⅛ | 2 19 2 |
| Consolidated Sig. | 24 | 27½ | 6¾ | −¼ | 4 1 5 |
| Cossor, A. C. (5/–) | 10* | 12½* | 45/6 | .. | 1 7 6 |
| Crabtree (10/–) | 17½ | 17½ | 44/– | +6d. | 3 19 7 |
| Crompton Parkinson Ord. (5/–) | 22½ | 22½ | 30/– | −6d. | 3 15 0 |
| De La Rue | 40 | 40 | 10¼ | .. | 3 18 0 |
| E.M.I. (10/–) | 8 | 8 | 35/9 | +2/3 | 2 4 9 |
| Elec.Construction | 10 | 12½ | 61/– | .. | 4 2 0 |
| Enfield Cable Ord. | 12½ | 12½ | 61/3 | −⅛ | 4 1 7 |
| English Electric | 10 | 10 | 55/– | +9d. | 3 12 9 |
| Ericsson Tel. (5/–) | 22* | 20* | 51/3 | −⅛ | 1 19 1 |
| Ever Ready (5/–) | 40 | 40 | 45/– | .. | 4 9 0 |
| Falk Stadelmann | 7½ | 10 | 42/6 | +1/3 | 4 14 0 |
| Ferranti Pref. | 7 | 7 | 34/6 | +1/– | 4 1 2 |
| G.E.C.: | | | | | |
| Pref. | 6½ | 6½ | 34/– | .. | 3 16 4 |
| Ord. | 17½ | 17½ | 94/– | +3d. | 3 14 5 |
| GeneralCable(5/–) | 15 | 15 | 18/– | −1/– | 4 3 4 |
| Greenwood&Batley | 15 | 15 | 42/6 | .. | 7 1 2 |
| H.T.A. (10/–) | 12½ | 12½ | 28/– | .. | 4 9 3 |
| Henley's (5/–) | 20 | 20 | 28/– | .. | 3 11 5 |
| 4½% Pref. | 4½ | 4½ | 24/6 | .. | 3 13 6 |
| Hopkinsons | 17½ | 20 | 90/– | +½ | 4 9 0 |
| India Rubber Pref. | 5½ | 5½ | 25/6 | +1/6 | 4 9 9 |
| Intl. Combustion | 30 | 32½ | 84/– | .. | 3 19 0 |
| Johnson & Phillips | 15 | 15 | 80/6 | +3/6 | 3 14 8 |
| LancashireDynamo | 22½ | 22½ | 5⅞ | +⅛ | 4 1 0 |
| Laurence,Scott(5/–) | 12½ | 12½ | 13/9 | .. | 4 11 0 |
| London Elec. Wire | 7½ | 7½ | 40/6 | −1/6 | 3 14 0 |
| Mather & Platt | 10 | 10 | 53/– | .. | 3 15 6 |
| Metal Industries(B) | 8½ | 9 | 47/6 | −⅛ | 3 15 9 |
| Met.Elec.CablePref. | 5½ | 5½ | 21/3 | .. | 5 3 6 |
| Mid. Elec. Mfg. | 25 | 25 | 7¾ | .. | 3 4 5 |
| Murex | 20 | 20 | 92/6 | +⅛ | 4 6 9 |
| Newman Ind.(2/–) | 20 | 20 | 8/6 | .. | 4 14 2 |
| Philco (2/–) | 25 | 10 | 11/3 | +9d. | 1 15 6 |
| Power Securities | 6 | 6 | 28/– | .. | 4 5 9 |
| Pye Deferred(5/–) | 25 | 25 | 35/– | −⅛ | 3 11 5 |
| Ransome & Marles | 20 | 20 | 92/6 | +⅛ | 4 6 9 |
| Revo (10/–) | 17½ | 17½ | 50/6 | .. | 3 9 6 |
| Reyrolle | 12½ | 12½ | 74/6 | .. | 3 7 2 |

(*Continued on next page*)

* Dividends are paid free of Income Tax.

| Company | Dividend Previous | Dividend Last | Middle Price Jan. 25 | Month's Rise or Fall | Yield p.c. |
|---|---|---|---|---|---|
| **Equipment and Manufacturing** (*Continued*) | | | | | £ s. d. |
| Siemens Ord. .. | 7½ | 7½ | 37/6 | +6d. | 4 0 0 |
| Strand Elec. (5/–) | 10 | 12½ | 12/– | +6d. | 5 4 2 |
| Switchgear & Cowans (5/–) .. | 20 | 20 | 22/6 | +1/6 | 4 9 0 |
| T.C.C. (10/–) .. | 7½ | 10 | 24/– | .. | 4 3 4 |
| T.C. & M. .. | 10 | 10 | 60/6 | +6d. | 3 6 0 |
| TelephoneMfg.(5/–) | 9 | 9 | 13/– | –3d. | 3 9 3 |
| Thorn Elec. (5/–) | 20 | 20 | 32/3 | .. | 3 2 2 |
| Tube Investments | 20 | 22½ | 6 | +¾ | 3 15 0 |
| Vactric (5/–) .. | Nil | 22½ | 24/– | +2/3 | 4 13 9 |
| Veritys (5/–) .. | 7½ | 7½ | 8/9 | +3d. | 4 5 9 |
| WalsallConduits(4/–) | 55 | 55 | 54/– | –1/– | 4 1 6 |
| Ward & Goldstone (5/–) .. .. | 20 | 25 | 33/– | .. | 3 15 9 |
| WestinghouseBrake | 14 | 14 | 75/6 | +1/– | 3 14 0 |
| West, Allen (5/–) | 7½ | 7½ | 8/9 | .. | 4 5 9 |
| **Traction and Transport** | | | | | |
| Anglo-Arg. Trans. : | | | | | |
| First Pref. (£5) | Nil | Nil | 2/– | .. | — |
| 4% Inc. .. | Nil | Nil | 5½ | +½ | — |
| Brit.Elec.Traction : | | | | | |
| Def. Ord. .. | 45 | 45 | 1035 | +10 | 4 7 0 |
| Pref. Ord. .. | 8 | 8 | 173 | .. | 4 12 6 |
| Bristol Trams .. | 10 | 10 | 50/– | .. | 4 0 0 |
| Brazil Traction .. | 2 | 2 | 32½ | +2½ | 6 3 1 |
| Calcutta Trams .. | 6½ | 7½ | 67/6 | –15/– | 2 4 5 |
| Cape Elec. Trams | 5 | 6 | 29/– | .. | 4 2 9 |
| Lancs. Transport | 10 | 10 | 43/6 | .. | 4 12 0 |
| Southern Rly. : | | | | | |
| 5% Prefd. .. | 5 | 5 | 72 | –½ | 6 19 0 |
| 5% Pref. .. | 5 | 5 | 114 | +4½ | 4 7 9 |
| T. Tilling .. | 10 | 10 | 48/6 | –1/– | 4 3 0 |
| West Riding .. | 10 | 10 | 43/9 | .. | 4 11 4 |
| **Telegraph and Telephone** | | | | | |
| Anglo-Am. Tel. : | | | | | |
| Pref. .. .. | 6 | 6 | 128½ | .. | 4 13 5 |
| Def. .. .. | 1½ | 1½ | 32½ | .. | 4 12 4 |
| Anglo-Portuguese | 8 | 8 | 28/– | .. | 5 14 4 |
| Cable & Wireless : | | | | | |
| 5½ Pref. .. | 5½ | 5½ | 112 | .. | 4 18 3 |
| Ord. .. .. | 4 | 4 | 100 | –2 | 4 0 0 |
| CanadianMarconi | $1 Nil | 4 cts. | 20/– | –1/– | — |
| Globe Tel. & Tel. : | | | | | |
| Ord. .. .. | 8½* | 5* | 43/6 | –1/– | 2 6 0 |
| Pref. .. .. | 6 | 6 | 31/6 | .. | 3 13 0 |
| Great Northern Tel. (£10) .. .. | Nil | Nil | 31½ | –1 | — |
| Inter. Tel. & Tel. | Nil | Nil | 34½ | –3 | — |
| Marconi-Marine .. | 7½ | 7½ | 32/6 | +3d. | 4 12 4 |
| Oriental Tel. Ord. | 4 | 4 | 64/6 | +8/– | — |
| Telephone Props. | Nil | 6 | 22/– | .. | 5 9 1 |
| Tele.Rentals(5/–) | 10 | 10 | 13/3 | +3d. | 3 15 6 |

* Dividends are paid free of Income Tax.

## Stocks and Shares (*Continued from page* 188)

off their recent lethargy and rose from 10s. to 11s. 3d.

### S. Smith & Sons' Capital

S. Smith & Sons (England) is among the companies in need of fresh capital to finance expansion of their business, and is raising it by the offer of new shares to existing shareholders. Preferred ordinary shareholders are to be offered one new preferred share, for every four held, at 75s. Deferred ordinary shareholders may apply for new 1s. shares in the same proportion, at 11s. The existing shares are quoted at 91s. 3d. and 14s. 6d. respectively, so that the value of the rights is considerable. Dividends over the past five years have been maintained at 37½ per cent. on the deferred and 17½ per cent. on the preferred. Previously, distributions had been up to 50 per cent. and 21 per cent. respectively. The preferred receive a fixed non-cumulative 7 per cent. and share the surplus of profits equally with the deferred.

### Oriental Telephones

At the end of last year, Oriental Telephones stood at 56s. 6d. A quick rise to 65s. 6d. was followed by a slight reaction to 64s. 6d. The company's profits which in 1940 were £130,000, dropped to £20,400 in 1944. The issued capital is £570,199 in ordinary shares of £1 each and the investments in British Government securities at the end of December, 1944, were valued at £1,151,530, which works out to about £2 per share. The remainder of the present quotation is represented by the assets, of which, a large part was in enemy-occupied territory. The company's holdings of shares in the Bengal, Bombay and Madras Telephone Companies were sold to the Government of India five years ago. The company has already resumed its telephone service in Singapore and Johore Bahru.

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## New Standard Telephones Organisation

A NEW organisation, Industrial Supplies Division, has been set up by Standard Telephones & Cables, Ltd. for the distribution of merchandise in the industrial field. Operating as a self-contained unit, it will handle the many products allied to or derived from the company's work in telecommunications. The division absorbs Stanelco Products, but the trade-mark "Stanelco" will continue to be used. The organisation will also supply and carry out installations of "Union" totalisators. There are sales offices in London, Birmingham, Bristol, Leeds, Manchester and Glasgow, and branch stores in Bristol and Manchester.

The manager, Mr. R. F. Ballard, formerly manager of Stanelco Products, will be assisted on the financial and market research side by Mr. W. A. Riches. Mr. A. G. Storey, at one time the company's Manchester representative, takes charge of rubber and plastic covered cables, while private telephone apparatus comes under the care of Mr. A. W. Hedley, who before the war looked after the South-Western area. The various sales offices and stores depots, including the London area, will be administered by Mr. L. G. Miller, for many years provincial manager.

# RECENT INTRODUCTIONS

## Notes on New Electrical and Allied Products

### Self-cleaning Magnetic Filter

TO the range of magnetic filters for machine-tool cutting lubricants available from PHILIPS INDUSTRIAL, Century House, Shaftesbury Avenue, London, W.C. 2, there has been added a further model, which is self-operating and self-cleaning, for dealing with up to 200 gal. of contaminated fluid per hour.

An elongated nozzle distributes the liquid evenly over an inclined non-ferrous channel, which is pivoted towards one end. Beneath it is a box containing a number of "Ticonal" magnets, which ensure the retention of ferrous particles on the surface of the non-ferrous channel. The clean liquid flowing off the end of the channel is directed by a chute into a tilting bucket. This gradually becomes unstable and suddenly tilts forward, rotating its pivoting shaft, which bears a crank and a chain attached to the brass channel which is thus tilted at the same time away from the influence of the magnet box, so the ferrous particles can be washed off in the reverse direction by the liquid in the channel.

### A Sample Moulder

A small hand-operated "Labpress" for model moulding experimentally before expensive tool commitments are made for production is announced by WRIGHT & WEAIRE, LTD., 740, High Road, Tottenham, London, N. 17. Provision can be made for metal inserts and, once the mould is made, from 50 to 100 samples can be produced according to the material used and the way pressings are finished. The press is electrically heated from ordinary mains and has a opening height of 5 in., the size of platens being 6 by 6 in. It exerts a pressure of about 4 tons, weighs 100 lb. and occupies 3 sq. ft. of bench space. The press can also be used for mounting small objects in bakelite for presentation, or metallographic specimens in transparent plastics to facilitate examination without damage.

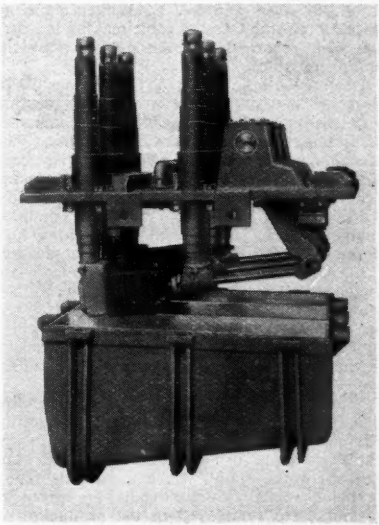
### Domestic Vacuum Cleaner

The household vacuum cleaner which is being sold under the trade name of "Celebrity" is manufactured by C.V.A. JIGS, MOULDS & TOOLS, LTD., Portland Road, Hove, 3, Sussex. It is a canister model with a calico dust bag inside the cylindrical steel body, which is covered with leatherette, fitted with a lifting handle and two floor skids. To prevent kinking, a swivel joint attaches the flexible suction hose of $\frac{3}{4}$ in. inside diameter to the metal end-cap, which is sealed with rubber rings and fastened to the body by two toggle clips.

The exhaust end of the cylinder is closed by a black bakelite moulding that houses the commutator motor, which is universal, taking 1·5 A at ordinary mains voltages; it revolves at 14,000 r.p.m. in 9 mm. ball bearings, which do not require oiling, and drives in series two 5 in. diameter fans made of plastic material. There is a flush mounted switch in the socket of the two-pin plug connector cable, which is rubber coated, and the usual suction hand tubes with brush and nozzle attachments are provided.

### Horizontal Breaker

A circuit-breaker of small oil content, horizontal single-break design, is announced by COOKE & FERGUSON, LTD., Victoria Street, Openshaw, Manchester, 11. It is fully metal



**Type E.5 oil circuit-breaker, 33 kV, 1,000 MVA, 800 A**

clad with a three-compartment tank for phase segregation, with arc-resisting linings and is removable for maintenance. Contacts can be renewed without removing the arc-control devices and their alignment is achieved by insulating slide-bearings incorporated in the sliding contact housing.

Operating levers and links are made of laminated wood, resin impregnated, each phase having separate dashpots, which are self-retaining to permit the breaker to be operated when the tank is lowered for inspection.

Solenoid, pneumatic, or spring closing mechanism can be provided. The overall inter-

rupting time is said not to exceed 0·1 second. The rating is 1,000 MVA at 33 kV, up to 800 A normal, and the breaker may be incorporated into fully metalclad transfer bus-bar equipment having 3 ft. 9 in. unit centres.

## Measuring Screw Thread Diameter

Screw thread measuring parallels announced under the trade name of "Marlco" by W. H. MARLEY & CO., LTD., 105, High Road, New Southgate, London, N.11, are claimed to have been designed and made in collaboration with the National Physical Laboratory for determining the effective diameter of any helix with the aid of two gauging members which are respectively wedge and vee shaped. They are placed diametrically opposite, with "elastic" strand linkage, and held by means of a micrometer so that the lesser dimension has merely to be subtracted from the greater. Thus the user does not have to rely on personal judgment as in the case of limit gauges and can see at a glance how much material needs to be removed to bring the machined part within the limits specified. Each pair of parallels is guaranteed to measure within 0·0002 in.

# German Cable Works

### American Investigators' Reports

LAST June two members of the United States Foreign Economic Administration, Messrs. R. A. Schatzel and W. L. White, made an inspection of the German cable-making industry and their reports have been published by the Stationery Office.

Dealing with the Felten & Guilleaume Carlswerke, Köln-Mulheim, the investigators mention that it is one of the largest electrical companies in Germany and has many subsidiaries. The managing director, Dr. Lehmann, has been suspended for Nazi activities and Messrs. Schatzel and White were conducted round the works by Dr. Hesse, the company's mining engineer. They found that the plant, which normally employed about 8,500 people was "30 per cent." damaged. The copper plant includes a refinery and rolling mill where copper, aluminium, copper alloys and copper-clad steel are rolled. Details are given of the rolling processes. There are no outstanding features in the wire-drawing department where standard type equipment is used.

The high-voltage paper cable insulating department was badly damaged and the testing equipment destroyed. All rubber-insulated cable is made by a subsidiary—Land- und Seekabelwerke—upon which a separate report is being made. Some details are given of formulæ, etc., employed in the production of polyvinyl-chloride cables. These were spark tested dry at 4,000 V and at 2,000 V after six hours' immersion. The company is said to have had poor success with polyethylene, produced by I. G. Farben under the name of "Lupolen," but it claims that a subsidiary, Norddeutsche Seekabelwerke, has made a submarine cable employing "Lupolen" instead of gutta-percha and also a paper-insulated cable using "Lupolen" to replace lead. It is claimed that Siemens-Schuckert have installed a considerable amount of paper telephone cable with this type of sheathing in lieu of lead. The company makes a considerable quantity of polystyrene lead-covered television cable.

The investigators found varying amounts of damage at the works of the Hackethal Draht- und Kabelwerke A.G. The wire enamelling and fine wire drawing departments were practically destroyed as were the high-voltage cable and electrical testing departments. The rolling mill (copper and aluminium) and the heavy wire drawing sections were little damaged.

Details are given of the company's wire enamelling plant and rubber and plastics department. It is mentioned that an endeavour was made to produce ignition cable but so much difficulty was experienced with "Buna S" that none was made. "Buna S" was used in the production of c.t.s. cable. A number of formulæ used in the production of "Buna" and other types of insulation are given in the report. For house wiring and low-voltage purposes cables were made consisting of two aluminium conductors strip insulated and taped with an extruded jacket of bitumen and longitudinally applied 30-mil zinc-aluminium or galvanised-iron sheath-crimp with interlocked edges. This was used for surface wiring. Where the wires were to be enclosed in conduit, installed in damp surroundings or directly buried in the ground additional coverings were applied—cellophane, soft asphalt, asphalted paper, braid and asphalt saturation and finish.

The investigators found that much damage had been done by Russian workers who eventually seized the plant, some of them remaining after hostilities ended.

The plant of the Suddeutsche Kabelwerke is equipped to manufacture bare and insulated copper and aluminium cables and "Pyrotenax." The bulk of the report on this works is devoted to formulæ of various "Buna" compounds used as insulation and to a description of the manufacturing processes for "Pyrotenax."

## Royal Institution Lectures

Friday evening discourses arranged by the Royal Institution include the following: "Radio-frequency Heating," by L. Hartshorn, February 8th; "The Protection of Ships from Magnetic Mines," by E. C. Bullard, February 15th; and "Æsthetics in Engineering," by Sir Charles Inglis, March 8th.

# Ash-plate Failures

## New Type Designed to Withstand Severest Conditions

FAILURES of ash-plates have always been a bugbear of chain-grate stoker operation and it has always seemed absurd that large units of steam-raising plant have to be taken out of service for so comparatively trifling a reason.

Study of cause and effects will show that unburned slabs of fuel, mainly carbon, are brought into contact with the ash-plates, or clinker dam, where they are broken up and so become amenable to attack by concentrated streams, or jets, of air emerging from beneath or between the ash-plate sections. The air fans the carbon into incandescence, resulting in a local temperature more than sufficient to burn or melt away the ash-plates. The various types of air seals fitted by the makers to prevent excessive leakage of air serve more as baffles than seals and a fair amount of air works its way to the rear, mainly through the spaces between the stoker links.

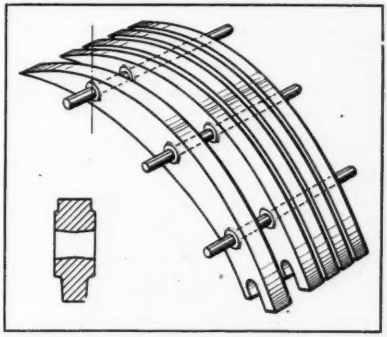
It was therefore decided, after many preliminary experiments, deliberately to allow this air to escape into the combustion zone, using it at the same time for cooling the ash-plates. It was not proposed to regard it as an aid to combustion, as any carbon arriving at the rear end of the stoker is deposited in the ash pit long before it is able to yield up any appreciable amount of heat. In other words, it is lost. It was also decided that the correct approach to the problem was the reduction of the bulk of metal in each individual ash-plate, which is in direct opposition to many attempts to get over the trouble by making the plates wider.

### Method of Construction

The ash-plate finally evolved was a narrow segment 1 in. wide on its upper surface and $\frac{3}{4}$ in. wide on its lower. The profile was similar to that of a standard ash-plate. Equally spaced over its length were cast-in three $\frac{3}{4}$ in. diameter holes and around each hole was a cast boss of $1\frac{5}{8}$ in. overall diameter. The boss stood "proud" of the main casting $\frac{1}{16}$ in. on each side. Thus, when two bars were placed together, there was a gap between them $\frac{1}{8}$ in. wide at the upper surface and $\frac{3}{8}$ in. at the bottom, tapered so as to allow small particles of ash to fall through.

To complete the assembly, a dozen bars were placed together and two lengths of $\frac{3}{4}$ in. pipe threaded through the two lower holes, which had been cast slightly countersunk each way, so that it was a simple matter to secure the assembly into a unit whole by merely expanding the pipe ends. Actual assembly was done on the grate surface adjacent to the rear of the stoker, so that the amount of heavy lifting to be done was greatly reduced. After the assembled units had been placed in position a third $\frac{3}{4}$ in. length of pipe was threaded through three complete sections, having the effect of coupling thirty-six individual bars together. It was found necessary to make up such an assembly to avoid individual units of the ash-plate being lifted up by semi-liquid slag adhering to the grate surface.

This lifting, or cocking up, is a contributory factor to failures, inasmuch, under such conditions, as red-hot combustible material can find its way to the underside of the assembly.



**Gloucester segmental ash-plate**

It will be noted that the noses of the bars have been made very sharp to enable them to shear through the "treacly" slag referred to.

On completion, the installation was subjected deliberately to the severest trial possible. Conditions were created which would have meant inevitable failure with the conventional type of ash-plates in use. It was noted that hot material reaching the ash-plate remained cherry red and did not "fan up" to white heat, this result being due to the large number of openings dissipating the draught.

There was no noticeable effect on $CO_2$ content, 12-13 per cent. remaining constant. Installations embodying rear secondary air nozzles would probably find the little extra air of assistance, as it would be entrained and thoroughly mixed with the combustible gases.

The device known as the "Gloucester segmental ash-plate" has been evolved and a patent applied for by Messrs. Bent & Blowen, of the Gloucester Corporation Electricity Department. An installation has been at work at Castle Meads power station on a 100,000-lb. boiler for three thousand hours without failure. Since then a further boiler has been similarly equipped and orders have been placed for equipment sufficient for all the boilers installed. The device is being manufactured in "Hercia" metal by the G.K.S. Combustion Co., Ltd., of Perseverance Works, Ashtead, Surrey.

# NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

H. F. ACKROYD and A. R. Tims. — "Wire-welding machines." 758. January 14th, 1944. (574586.)

Aktiebolaget Elektrolux.—"Heat transfer systems." 1741/44. January 14th, 1943. (574592.)

Ashley Accessories, Ltd., and W. P. Kempster. —"Variable electric condensers." 2158. February 5th, 1944. (574596.)

British Tabulating Machine Co., Ltd.— "Apparatus for sensing electrical conductive marks on record cards or sheets of moisture absorbent material." 530/44. January 12th, 1943. (574492.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—"Gas turbine cooling arrangements." 15202. November 25th, 1941. (574478.) "Cooling arrangements for gas turbines." 10341. August 14th, 1941. (574545.) "Gas turbine arrangements suitable for aircraft." 13441. October 18th, 1941. (574547.)

British Thomson-Houston Co., Ltd., and A. P. Castellain.—"Reproduction from sound records." Cognate applications 13809/43 and 693/44. August 24th, 1943. (574557.)

British Thomson-Houston Co., Ltd., J. G. Wellings and W. S. Adams.—"Terminal blocks for electric conductors." 21167. December 17th, 1943. (574570.)

L. F. Broadway and C. S. Bull.—"Electron discharge devices." 4073. March 5th, 1940. (574512.)

Callender's Cable & Construction Co., Ltd., R. W. Lunt, J. A. Burns and G. J. Dean.— "Process for the preparation of diamond dies for wire drawing and like operations." 13526. July 14th, 1944. (574635.)

Chloride Electrical Storage Co., Ltd. (J. Woodbridge).—"Vents for electric accumulators." 15371. August 11th, 1944. (574538.) "Filling and venting devices for electric accumulators." 15273. August 10th, 1944. (574637.)

J. A. Crabtree & Co., Ltd., and R. W. Morgan.—"Electric switches of the ceiling or pull-operated type." 2081. February 4th, 1944. (574503.) "Sockets of electric couplings." 1916. February 2nd, 1944. (574533.)

H. Dent and J. Wolff.—"Telephone receivers." 19336. November 19th, 1943. (574523.)

Dubilier Condenser Co. (1925), Ltd., and P. R. Coursey.—"Ceramic compositions." 17468. December 8th, 1942. (574577.)

Express Lift Co., Ltd., L. E. W. Wells and F. W. F. Goffe.—"Electric inductor relays." 2549. February 11th, 1944. (574629.)

Ferranti, Ltd., A. L. Chilcot and S. Jackson.— "Mounting of electrodes in electric discharge tubes." 8887. June 27th, 1942. (574480.)

W. A. Gillott and Gillott Electro Steam Cookers, Ltd.—"Water heaters and steam cookers." 11214. June 12th, 1944. (574509.)

J. E. Lennard Jones and J. W. Mitchell.— "Luminous discharge tubes." 21822. December 29th, 1943. (574581.)

W. C. Karasek.—"Stripping tool for electric cables." 2284. February 8th, 1944. (574602.)

Mallory Metallurgical Products, Ltd., and N. A. Tucker.—"Resistance welding machines." 1966. February 3rd, 1944. (574495.)

M. O. Valve Co., Ltd., and C. W. Cosgrove.— "Thermionic valves." 1914. February 2nd, 1944. (574594.)

R. F. Oxley.—"Electrical condensers." 8795. June 26th, 1942. (574574.)

Patelhold Patentverwertungs & Elektro Holding Akt. Ges.—"Magnetron for producing very short electromagnetic waves." 3254/43. February 9th, 1942. (574551.)

Philips Lamps, Ltd., O. Pressel and G. A. M. Diepstraten.—"Metal-glass joints." 2022. February 3rd, 1944. (574500.)

V. Planer and F. E. Planer.—"Means for the determination of the eccentricity of the conductor with regard to the dielectric in insulated wires and cables." 2377. February 9th, 1944. (574618.)

Radio Transmission Equipment, Ltd., and C. E. G. Bailey.—"Electric filters." 11334. September 4th, 1941. (574546.)

F. Sigmund and W. S. Hlavin.—"Slotted cores for dynamo-electric machines." 17299. October 20th, 1943. (574491.)

Standard Telephones & Cables, Ltd.— "Ribbon cable and method of manufacturing same." 2077/44. February 5th, 1943. (574612.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).— "Radio relay system." 2544. February 11th, 1944. (574627.)

Standard Telephones & Cables, Ltd., C. T. Scully and H. A. Waters.—"Electric amplifying circuits." 2538. February 11th, 1944. (574626.)

A. H. Stevens (Gibson Electric Refrigerator Corporation).—"Absorption refrigeration apparatus." 20079. December 1st, 1943. (574564.)

Sturtevant Engineering Co., Ltd., and C. H. Harris.—"Apparatus for collecting dust or the like from air or other gas." Cognate applications 1714/44 and 10999/44. January 29th, 1944. (574591.)

Superheater Co., Ltd., and A. P. J. Huet.— "Steam superheater elements for use in the smoke tubes of boilers." 2064. February 4th, 1944. (574502.)

Telephone Manufacturing Co., Ltd., and L. H. Paddle.—"Processes for making metallic alloys." 395. January 8th, 1944. (574583.)

G. Turnock, Ltd., and W. E. Taylor.— "Electric switches of the press-button type." 2512. February 10th, 1944. (574625.)

Varley Dry Accumulators, Ltd., L. Fuller, J. A. Szper and H. D. Lark.—"Electric secondary batteries." 2348. February 8th, 1944. (574616.)

Whipp & Bourne, Ltd., and I. T. L. Whipp.— "Overload protection of electrical energy distribution systems." 2159. February 5th, 1944. (574597.)

J. M. Wilson and Epsem, Ltd.—"Electrically heated soldering irons." 1989. February 3rd, 1944. (574498.)

# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

## Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.*

**Aberdare.**—February 18th. Electricity and Transport Department. 3-kV switchgear. (January 25th.)

**Ashton-under-Lyne.**—February 25th. Sewage Purification Committee. Electrical wiring, lighting, heating and power at the Corporation sewage works. (See this issue.)

**Belfast.**—February 22nd. Electricity Department. Electrical stores and materials. (See this issue.)

**Berwick-upon-Tweed.**—Corporation. February 6th. Ranges, electric wash boilers, and immersion heaters for 40 houses. Schedules from borough surveyor.

**Bexley.**—February 11th. Electricity Department. Paper-insulated underground cables. (January 25th.)

**Birkenhead.**—February 18th. Electricity Department. Supply of electric lamps for twelve months. (January 25th.)

**Cheadle & Gatley.**—February 11th. Electricity Department. Cables, lamps and meters. (January 25th.)

**Dumfries.**—February 10th. Electricity Department. One 300-kVA and two 500-kVA transformers. (January 18th.)

**Erith.**—February 28th. Electricity Department. Electrical materials for twelve months. (See this issue.)

**Hastings.**—February 19th. Electricity Department. Cable laying. (See this issue.)

**India.**—DELHI.—March 15th. Delhi Central Electric Power Authority. Switchgear and transformers. (January 25th.)

**Kensington.**—February 12th. Borough Council. Electrical goods (cables, flexibles, tapes, conduits, fittings and accessories), for twelve months. Particulars from the town clerk, Town Hall, W.8.

**Kettering.**—February 23rd. Electricity Department. Supply, delivery and erection of cast-iron pipes and headers to recondition two economisers. (January 25th.)

**Norwich.**—February 12th. Electricity Department. Ripple control equipment. (Jan. 25th.)

**Skelton & Brotton.**—February 19th. Electricity Department. Wash-boilers, cookers, lighting columns and lanterns. (January 25th.)

**Southampton.**—February 15th. Electricity Department. Electric meters for twelve months. (See this issue.)

**Southend-on-Sea.**—February 7th. Electricity Department. Meters. (January 18th.)

February 28th. Electricity Department. Electrode boiler plant, etc., for the Hot Sea Baths Establishment. (January 25th.)

**Southwark.**—February 16th. Electricity Department. Pipework for circulating water mains between cooling towers, circulating pump and condenser of a steam turbo-generator. (See this issue.)

**Sunderland.**—February 11th. Council. Electrical installations on the Springwell Farm estate. (January 25th.)

**Worcester.**—February 26th. Electricity Department. Cables, conductors, transformers, meters and joint boxes for twelve months. (See this issue.)

## Orders Placed

**Bermondsey.**—Electricity Committee. Accepted. 400-A 6,600-V oil circuit-breaker (£254).—A. Reyrolle & Co. 500-kVA transformer (£492).—British Electric Transformer Co. 1,000-A switch unit (£170) and ring main opener unit (£358).—Johnson & Phillips.

**Croydon.**—Electricity Committee. Accepted. Replating batteries (£1,048).—Tudor Accumulator Co.

**London.**—Metropolitan Water Board. Accepted. Six impellers for electric pumps (£450).—W. H. Allen, Sons & Co. Modifying two 150-kW rectifier units at Lea Bridge works (£440).—Bruce Peebles. Cable for Hampton works (£176).—Siemens Bros. Re-winding motor of emergency portable plant (£132).—Hayward Tyler & Co.

**Newcastle-on-Tyne.**—City Council. Accepted. Switchgear for change-over of the street lighting system from DC to AC (£1,552).—A. Reyrolle & Co.

**Poplar.**—Electricity Committee. Accepted. Twelve feeder pillar units (£128).—W. Lucy & Co. 500 wash boilers (£2,000).—Universal Boilers & Engineering Co.

**Stoke Newington.**—Electricity Committee. Recommended. Cookers (100 at a cost of £1,474).—Belling & Co.; G.E.C. Cooker control units (100 costing £109).—M.K. Electric. Repair, conversion or replacement of 220 meters (£789) and 141 demand indicators (£262).—Reason Manufacturing Co.

**Watford.**—Electricity Committee. Accepted. 500-kVA transformer (£529) and truck type cubicles (£799).—Metropolitan-Vickers.

## Contracts in Prospect

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Auchterarder (Perthshire).**—Houses (47), for Town Council; town clerk.

**Birkenhead.**—Buildings for nursing and domestic staff at the General Hospital, Derby Road (£200,000); L. Barnish, architect, 58, Rodney Street, Liverpool, 1.

**Bo'ness.**—Houses (50), for Town Council; burgh surveyor.

**Brighton.**—Primary school and community centre, Sheepcote Valley; borough engineer.

Factory, off Moulsecoomb Way; Brighton & Hove Herald, Ltd.

**Broughton.**—Works and offices, Caroline Street, for Erskine, Heap & Co.; W. Thorpe & Son, builders, Chester Road, Cornbook, Manchester, 16.

**Crook (Co. Durham).**—Brickworks; F. C. Carling, Ivy Crescent, Roddymoor.

**Croydon.**—Extensions, Davidson School (£20,000); J. K. Hicks, architect.

Kitchen, Ashburton School (£4,500); borough engineer.

Pre-fabricated schools (£8,100); borough engineer.

Pumping plant, including electrical work, Surrey Street works; water engineer.

**Exeter.**—Houses (100), Pinhoe estate (£136,000); city architect.

**Falkirk.**—Houses (380), for Town Council (£408,000); burgh surveyor.

Foundry and offices for J. & R. Walker Bros., Burnbank Foundry (£2,500); manager.

**Galashiels.**—Houses (78), for Town Council; town clerk.

**Gateshead.**—Flats (54), in the Sunderland Road area for the T.C.; borough engineer.

Flour mill; J. Rank, Ltd., Bigg Market, Newcastle-on-Tyne.

Sports stadium, cinema, theatre, etc.; North Eastern Trading Estate, Team Valley.

Model factory at the Teams; Redheugh Iron & Steel Co., Ltd.

**Glasgow.**—Houses (240), Pollok estate (£276,415); housing director.

Balcony type tenements (760), for Corporation; architect, Housing Department.

Houses (114), for Lawrence Building Co., Ltd., 50, Wellington Street; architect.

**Hackney.**—Rebuilding flats, Wrens Park estate (£4,485); W. W. Rowney & Co., Ltd.

**Hampstead.**—Renovations, Harben school (£3,750); L.C.C. architect.

**Heywood.**—Works canteen, Crimble cotton mill, for J. Kenyon & Sons; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester, 2.

**High Wycombe.**—Houses (82), Hatters Farm estate (£90,000); Eadie & Co. (Wolverhampton), Ltd., Clarence Street, Wolverhampton.

**Ilford.**—Extensions, nurses' home, Isolation Hospital; borough engineer.

**Kelso.**—Houses (37), for Town Council; burgh surveyor.

**Leeds.**—Maternity isolation unit and infirm wards, St. James' Hospital North, for Health Committee; S. Flockton, Ltd., builders, St. Agnes' Mount Works, Leeds, 9.

**Lewisham.**—Conversion of requisitioned property to flats (£62,070); borough engineer.

**Lochgilphead.**—Houses (42), for Town Council; town clerk.

**Macclesfield.**—Houses (148), Ivy Road estate; borough architect, Pear Tree House.

**Markinch.**—Houses (38), for Town Council; A. D. Haxton, architect, Leven.

**Maryport.**—Houses (56), for the North-Eastern Housing Association, Newcastle-on-Tyne; J. W. White, builder, High Barnes Works, Sunderland.

**Middlesbrough.**—Hotel, Cargo Fleet Lane, for Beverley Bros., Ltd.; Kitching & Co., architects, 40, Albert Road.

**Newcastle-on-Tyne.**—Houses (36), in Silver Lonnen, for W. H. Oliver; J. McKenzie, 13, Mosley Street.

Houses (174), on Longbenton & Blakelaw housing estates; housing architect, 18, Cloth Market.

**Paisley.**—Nurses' home, Barshaw Hospital (£6,834) and annexe (£1,150); burgh surveyor.

**Poplar.**—Houses (56), Abbott Road; borough engineer.

**Renfrew.**—Factory (£20,000); King Aircraft Corporation.

**Spennymoor (Co. Durham).**—Houses (112), for North Eastern Housing Association; G. H. Gray, 56, Camden Street, North Shields.

**Stalybridge.**—Houses (24), Besom Lane (£29,182); J. Ridyard & Sons, Ltd., builders, Railway Saw Mills, Ashton-under-Lyne.

**Stockton-on-Tees.**—Houses (100), Darlington Lane, for the T.C.; Lane, Fox & Co., Ltd., builders, Manchester.

**Stone.**—Houses (28), Rough Close and Barlaston sites, for R.D.C. (£33,020); J. Banks, builder, Lichfield Road.

**Sunderland.**—Electrical installations in 804 permanent houses on the Springwell Farm estate; J. E. Lewis, borough engineer.

**Watford.**—Works and offices, Station Approach, Cassiobury Park; Caffin & Co., Ltd.

**Wood Green.**—Welfare centre, Alexandra Park area (£7,500); borough engineer.

## TRADE MARKS

THE following applications for the registration of trade marks have been made. Objections may be entered within a month from January 23rd.

CROCODILE. No. 632,626, Class 9. Welding apparatus and parts thereof not included in other classes; welding electrodes.—International Welding Co., Ltd., 2, South Parade, Bedford Park, London, W.4.

CYKO. No. 633,546, Class 9. Telegraphic, telephonic and wireless apparatus and instruments, phonographs; optical apparatus and instruments, etc.; and parts and fittings, not included in other classes, of all these goods.—General Aniline & Film Cpn., 247, Park Avenue, New York (Address for service: c/o McKenna & Co., 14, Waterloo Place, Pall Mall, S.W.1.

HYKAP. No. B635,796, Class 9. Electric condensers, resistances, wave filters, apparatus for testing electrical insulation; and electrically operated thermostats and thermometers.—Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, W.3.

Two spaniels on cable drums, with the words "Trustworthy Friends" (design). No. 636,566, Class 9. Electric cables and insulated electric conductors. Also No. 636,567, Class 17. Electric insulation material and insulation parts.—Duratube & Wire, Ltd., 16, Hanworth Road, Feltham, Middlesex.

AQUATECTOR. No. 637,435, Class 9. Electrical apparatus and instruments not included in other classes; measuring apparatus, etc.—J. Burns, Ltd., Wangye Works, High Road, Chadwell Heath, Essex.

AEROPLAS. No. 635,912, Class 17. Insulating tubing.—Aerialite, Ltd., Castle Works, Back Grosvenor Street, Stalybridge, Cheshire.